Amplify Desmos Math
NEW YORK

Assessment Guide Sampler
Grade 8

Inside you'll find:

- Unit Assessments
- Exit Tickets

For Review Only.
Not Final Format.

Amplify Desmos Math
NEW YORK

Grade 8

Student Edition Sampler

About Amplify

Amplify is dedicated to collaborating with educators to create learning experiences that are rigorous and riveting for all students. Amplify creates K–12 core and supplemental curriculum, assessment, and intervention programs for today's students.

A pioneer in K–12 education since 2000, Amplify is leading the way in next-generation curriculum and assessment. All of our programs provide teachers with powerful tools that help them understand and respond to the needs of every student.

Cover illustration by Caroline Hadilaksono.

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Table of Contents

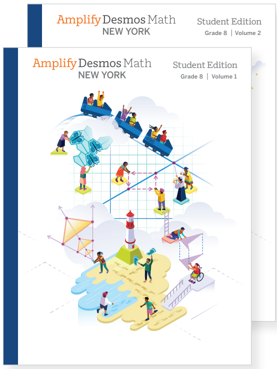
Assessment Overview

Unit Assessments | Including Pre-Unit Checks, Sub-Unit Quizzes, and End-of-Unit Assessments.

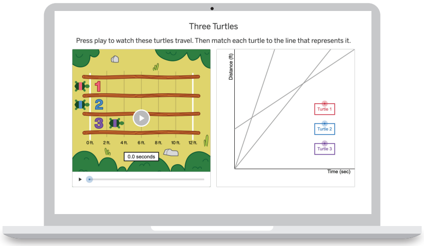
Exit Tickets | Including Exit Tickets from all lessons in every unit.

Amplify Desmos Math New York program resources

Student bundle includes:



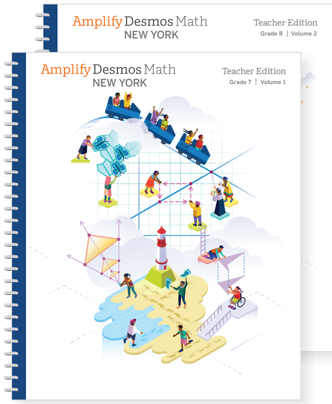
NY Student Edition,
multivolume, consumable



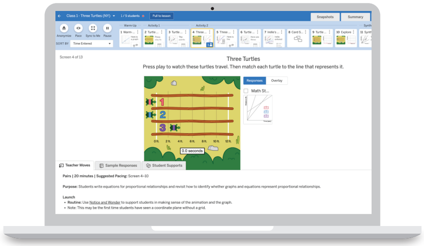
NY Digital Experience (English and Spanish), featuring:

- Interactive Student Activity Screens
- Enriched feedback
- Collaboration tools

Teacher bundle includes:



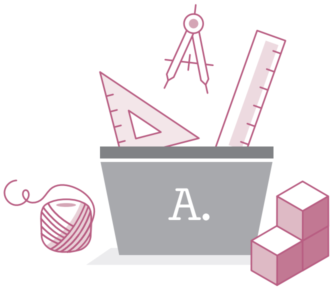
NY Teacher Edition,
multivolume, spiral-bound



NY Digital Experience (English and Spanish), featuring:

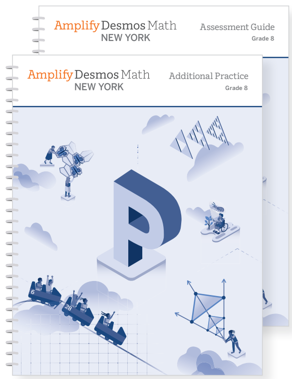
- Facilitation and progress monitoring tools
- Presentation Screens
- Instructional supports
- Assessment

Optional:



Middle School Manipulative Kit (Grades 6–8)

Extra Practice and Assessment Blackline Masters



Additional components and features may roll out over time.

Program architecture

Course

I mCLASS beginning-of-year diagnostic screener

I Interim Assesments

UNIT 1	UNIT 2	UNIT 3	UNIT 4	UNIT 5	UNIT 6	UNIT 7	UNIT 8
20 days	16 days	16 days	20 days	22 days	17 days	19 days	20 days

Unit

A Pre-Unit Check

A Sub-Unit Quiz

End-of-Unit Assessment A

- Sub-Unit 1
- Sub-Unit 2 Practice Day
- Sub-Unit 3 Practice Day

1 2 3 4 5 6 7 | 8 9 10 11 12 PD | 13 14 15 16 17 18 19 20 PD

Note: The number of sub-units and lessons vary from unit to unit; this depiction shows the general structure of a unit.

Lesson

Warm-up	Activity 1	Activity 2	Synthesis	Exit Ticket	Practice
5 min	15 min	15 min	5 min	5 min	timing varies

Note: The number of activities and timing vary from lesson to lesson; this depiction shows the general structure of a lesson.

Key:

- Independent
- Small Groups
- Pairs
- Whole Class

Our robust assessments drive learning and inform instruction.

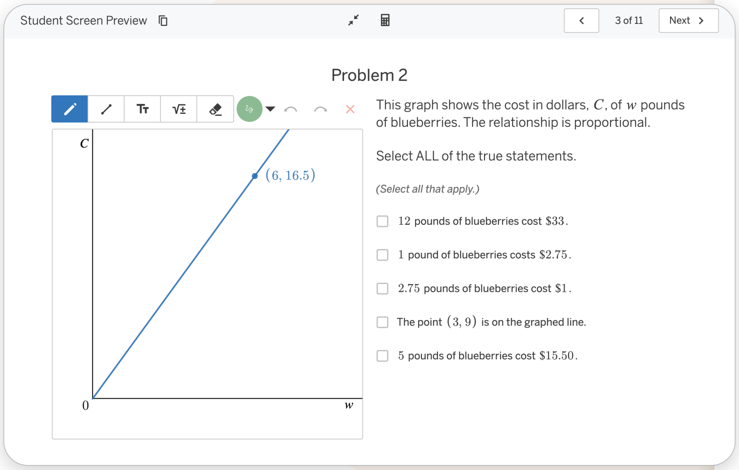
A variety of performance data in Amplify Desmos Math New York provides evidence of student learning, while helping students bolster their skills and understanding.

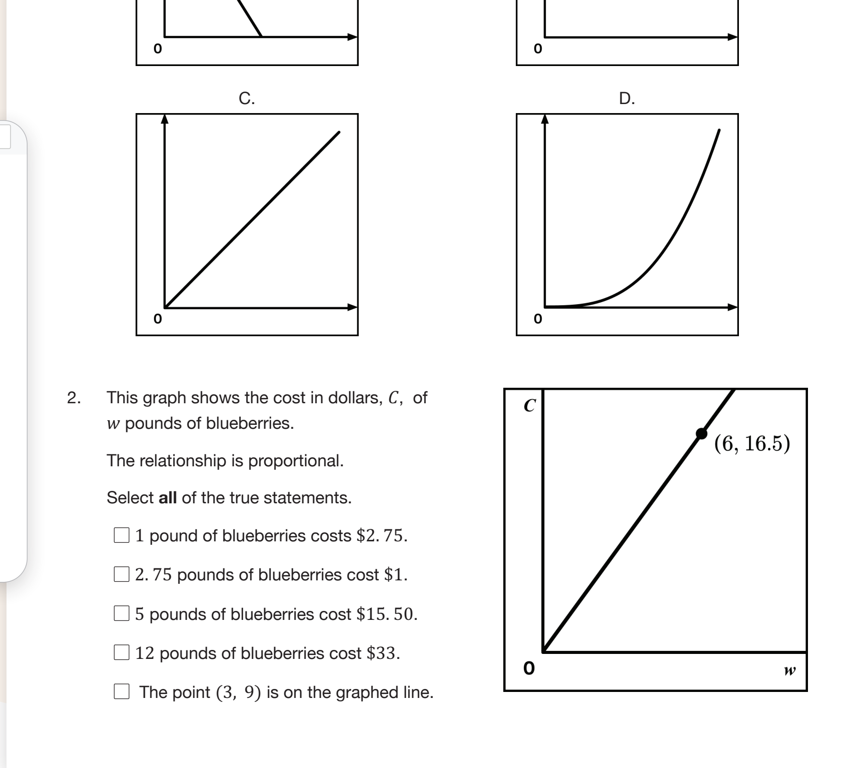
Throughout lessons, units, and the entire program, you'll find summative and formative assessments meant to provide insights into students' conceptual understandings. Student learning is never a surprise at the end of a unit—with Amplify Desmos Math New York, understanding is made continually visible.

Course-level assessments

Our beginning-of-year digital diagnostic tool measures what students know and how they think, providing teachers with targeted, actionable insights and instructional guidance. These assessments identify areas to target for students who need additional support and opportunities to extend for students who would benefit from more challenge.

- **mCLASS beginning-of-year diagnostic screener:** This tool measures the critical skills and concepts aligned to standards that are predictive of future math success. Innovative problem types reveal the processes required for math reasoning and the problem-solving strategies that go beyond the conceptual and procedural knowledge of grade-level math. They also help teachers identify students at risk for math difficulty (including difficulties related to dyscalculia) and provide detailed information about what students know and in which areas they need support. This diagnostic is in the process of being fully validated through third-party research studies conducted by WestEd.
- **Ongoing interim assessments:** These pre-generated and assignment-ready practice sets review critical moments in instruction. Teachers can create their own assessments and practice sets through the online item bank.





Digital and print assessment examples

Unit-level assessments

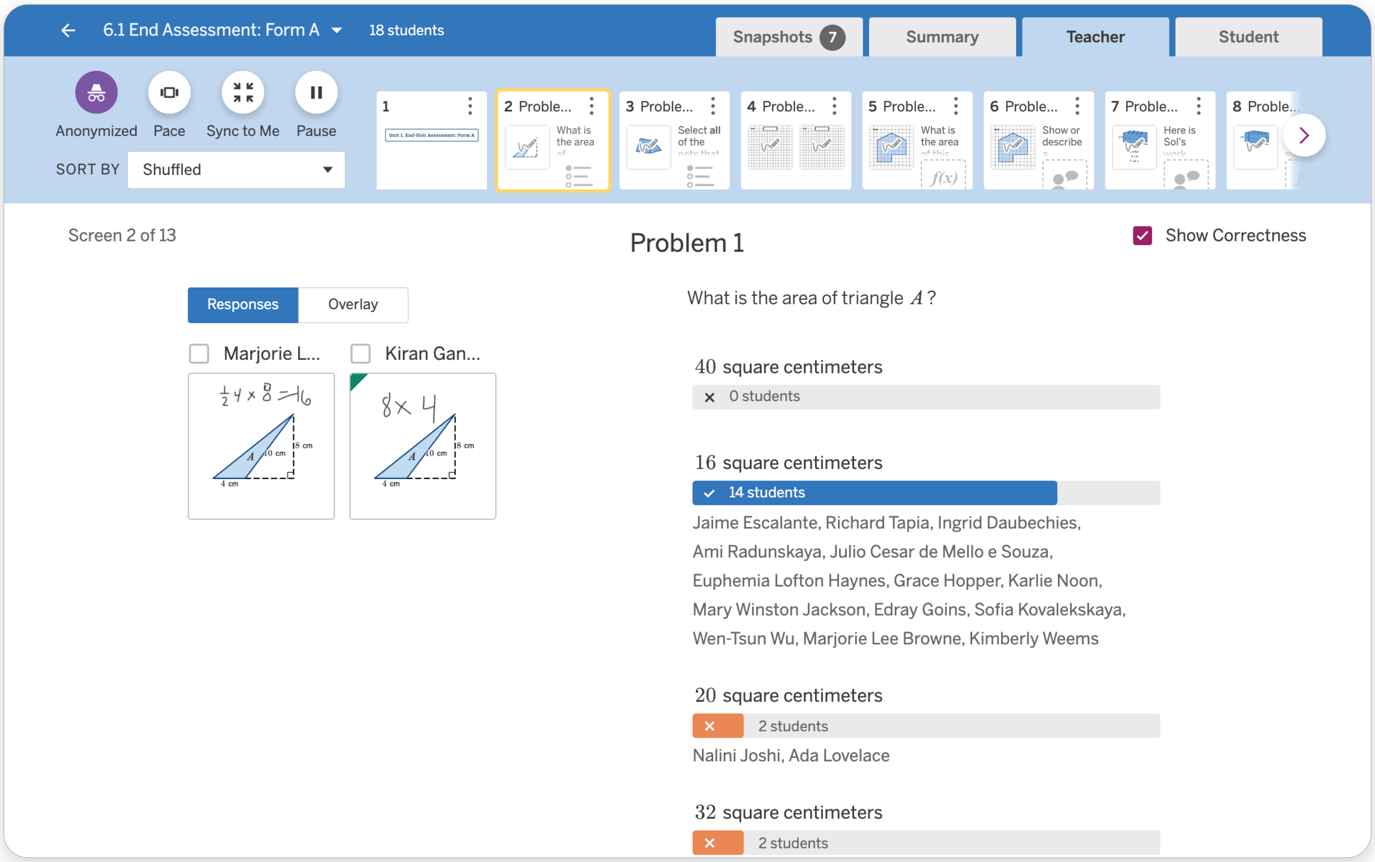
Our embedded unit assessments offer key insights into students' conceptual understanding of math. These assessments provide regular, actionable information about how students are thinking about and processing math, with both auto-scoring and in-depth rubrics that help teachers anticipate and respond to students' learning needs.

- **Pre-unit check:** Each unit begins with a check to determine student proficiency with prerequisite skills needed for success in the upcoming unit. This check is agnostic to the standards covered in the following unit and serves not as a deficit-based acknowledgement of what students do not know, but rather as an affirmation of the knowledge and skills with which they come in.
- **Sub-unit quizzes:** Student understanding never comes as an end-of-unit surprise with regular sub-unit quizzes. In these checks, students are assessed on a subset of conceptual understandings from the unit, with rubrics that help illuminate where students are and insight into what supports they need to get where they need to go.
- **End-of-Unit Assessment:** Students engage with rigorous grade-level mathematics through a variety of formats and tasks in the End-of-Unit Assessment. A combination of auto-scored and rubric-scored items provide deep conceptual insight.

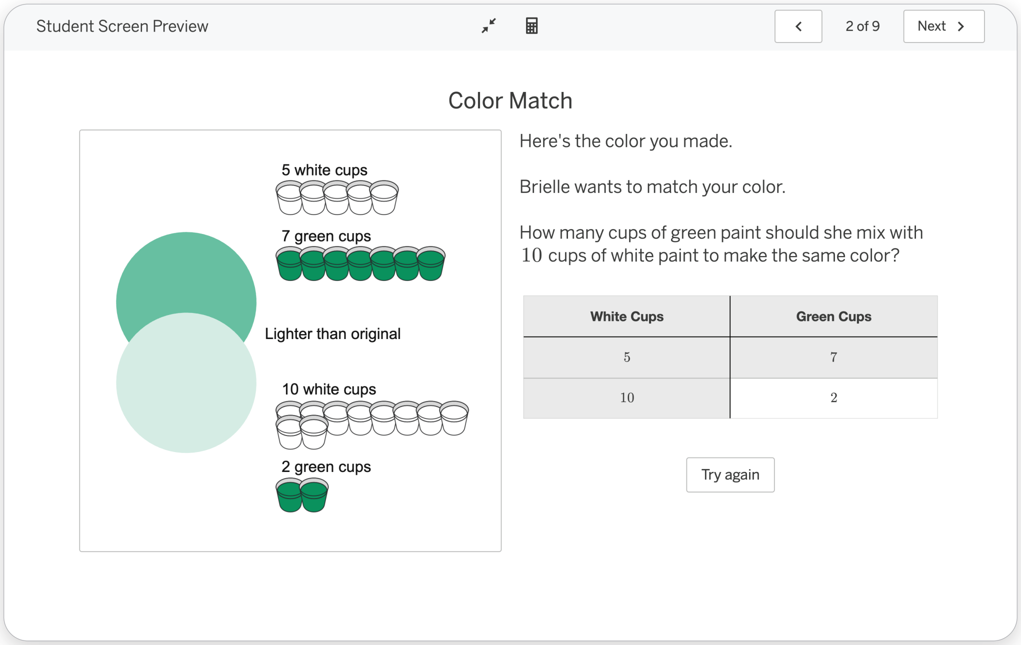
Lesson-level assessments

Amplify Desmos Math New York lessons are centered around sense-making and in-the-moment feedback. Daily moments of assessment provide valuable evidence of learning for both the teacher and student.

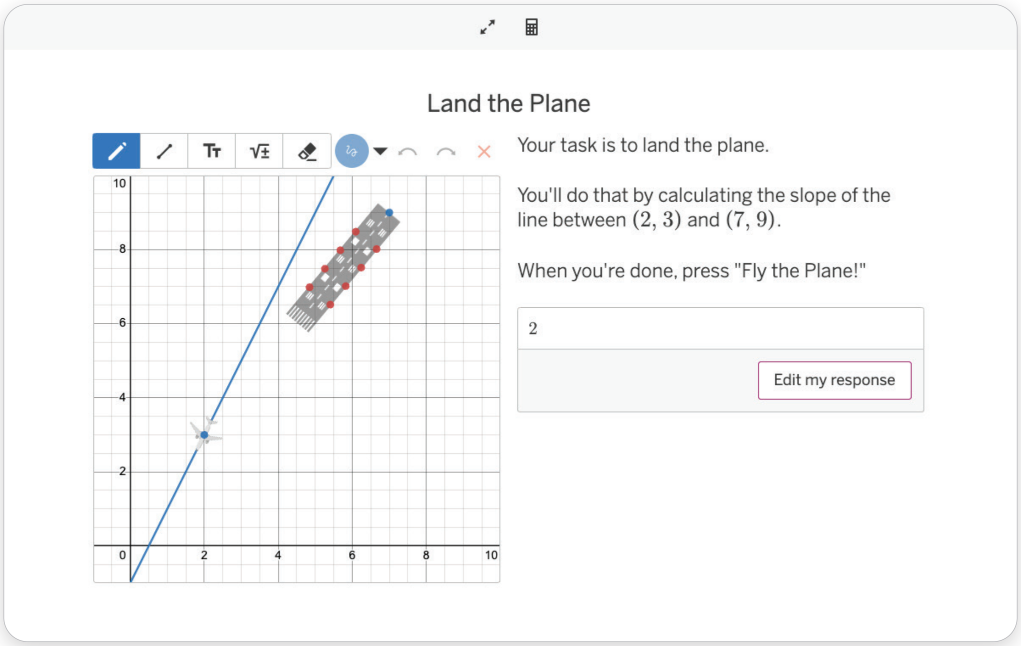
- **Exit Tickets:** Each lesson has an Exit Ticket focused on one of the key concepts in the lesson. Exit Tickets are carefully designed to minimize the time they take to complete while maximizing the insight the teacher receives on a daily basis in order to attend to student needs during the following class.
- **Enriched feedback:** We harness the power of digital math and graphing tools to show students the meaning of their thinking in context.



Enriched feedback motivates students and engages them in the learning process.



Rather than telling a student if their paint ratio is right or wrong, we mix the colors for them.



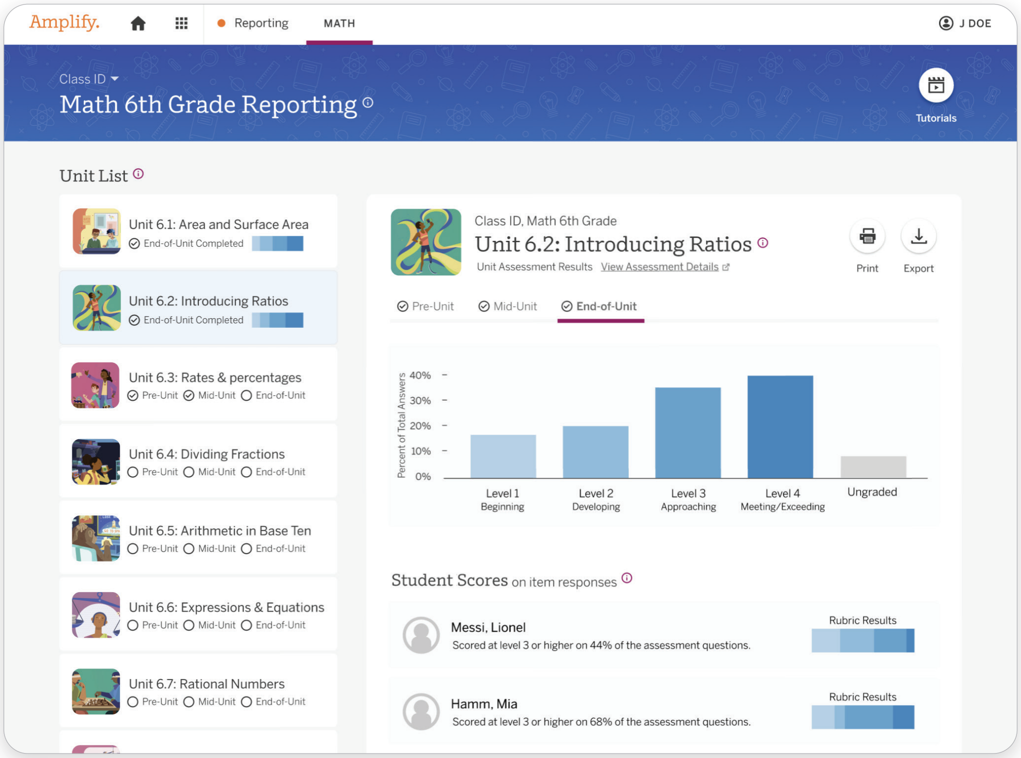
Rather than telling a student if their slope is correct, we use it to land a plane.

Reporting tools monitor progress and provide insight into learning.

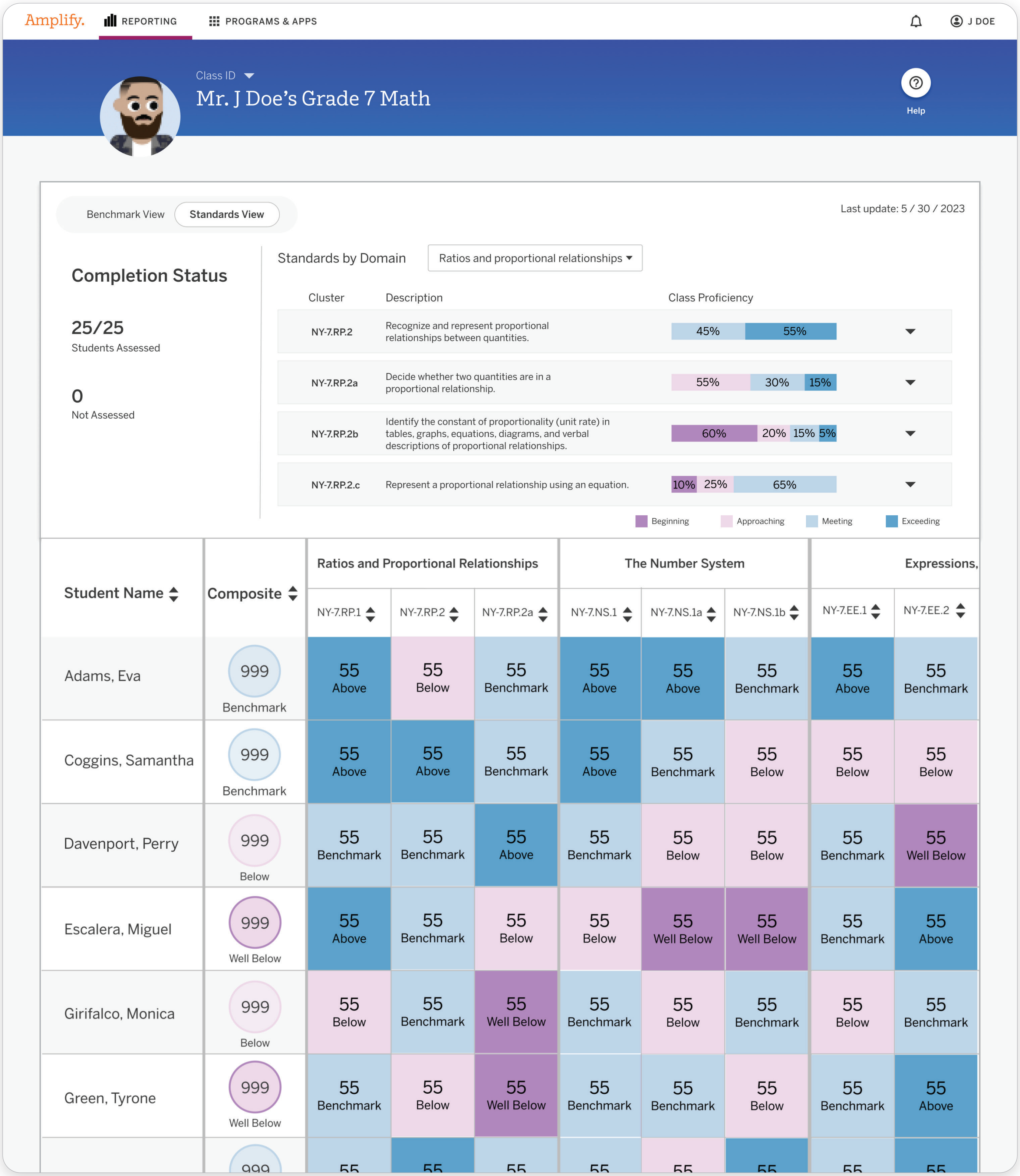
Amplify Desmos Math New York provides teachers and administrators with unified reporting and insights so that educators have visibility into what students know about grade-level math—and can plan instruction accordingly for the whole class, small groups, and individual students.

Our reports show proficiency and growth by domain, cluster, standard, and priority concept using performance data from unit assessments, then highlight areas of potential student need to allow teachers to modify their instruction and target differentiated support.

The program also includes reports on student usage, performance on benchmark assessments, school and district data, and information for caregivers. Our team will partner with you to meet the specific data and reporting needs of New York City Public Schools.



At-a-glance views of unit-level assessment results inform instructional planning, and you can also drill down to item-level analysis.



Our standards report allows you to monitor proficiency at the class and individual student levels.

GRADE 8

Amplify Desmos Math
NEW YORK

Assessment Sampler

This section includes all unit-level assessments from Amplify Desmos Math New York for Units 1–8.

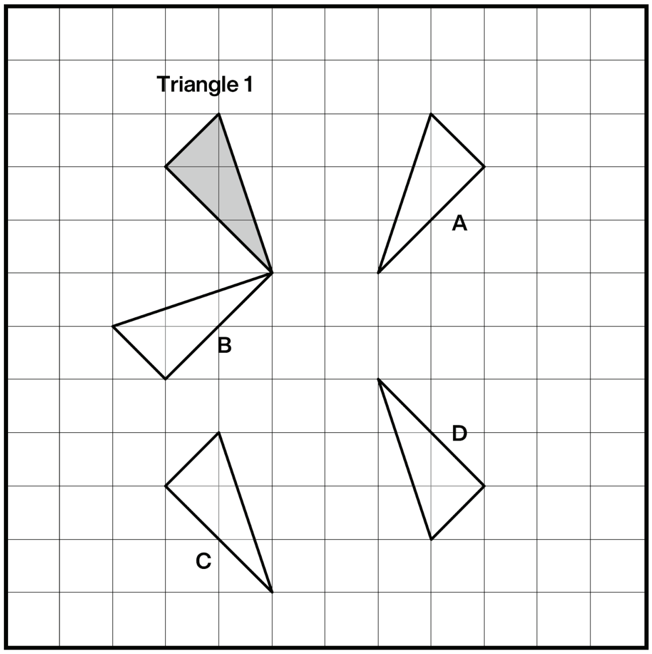
- **Pre-unit Readiness Checks** are designed to help teachers see which concepts and skills from previous units and grades need to be bolstered in order for students to be successful.
- **Sub-unit Quizzes** are formal measures of what students know and can do for the lessons that immediately precede the quiz.
- **End-of-Unit Assessments** are formal measures of what students know and can do for all the lessons in the unit, with an emphasis on the critical concepts and skills of the unit.

 Name ______________________________

Problem 1

Select **all** of the triangles that can be rotated to match up with Triangle 1.

- ☐ A
- ☐ B
- ☐ C
- ☐ D



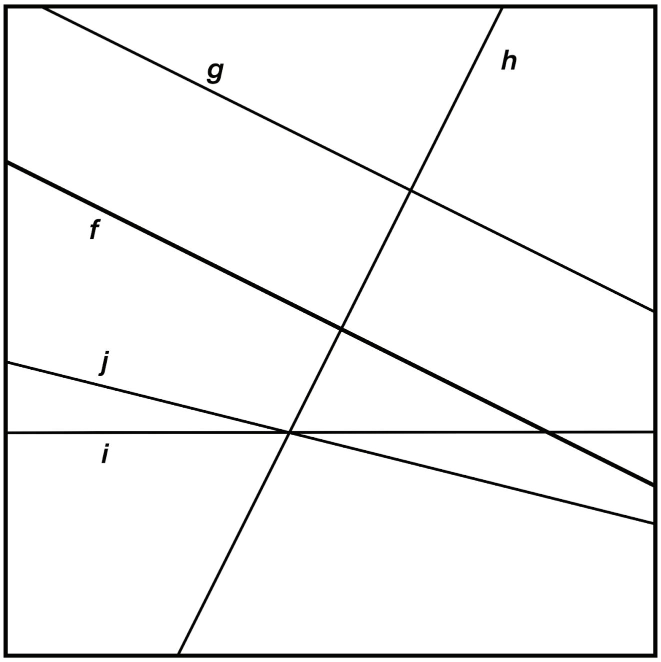
Problem 2

2.1 Select **all** of the lines that appear parallel to line f.

- ☐ g
- ☐ h
- ☐ i
- ☐ j

2.2 Select **all** of the lines that appear perpendicular to line f.

- ☐ g
- ☐ h
- ☐ i
- ☐ j

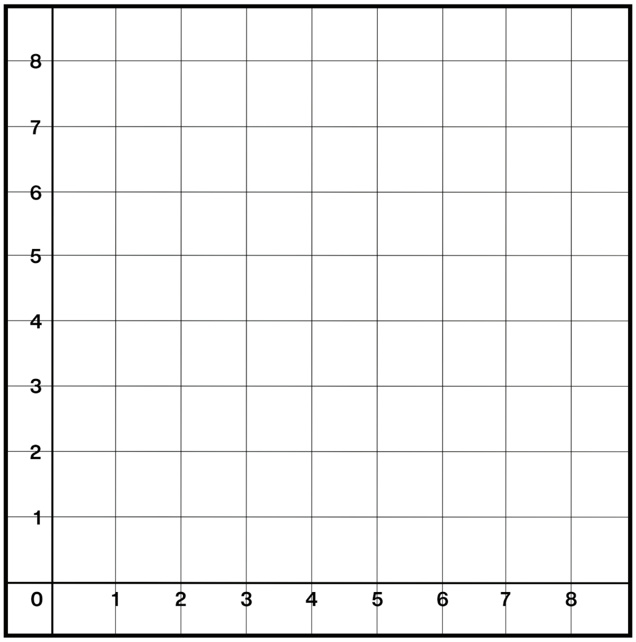


Name ______________________________

Problem 3

3.1 Plot the points on the coordinate plane.

Point	Coordinates
A	$(2,\ 1)$
B	$(5,\ 1)$
C	$(7,\ 2)$
D	$(4,\ 2)$



3.2 What is the length of CD?

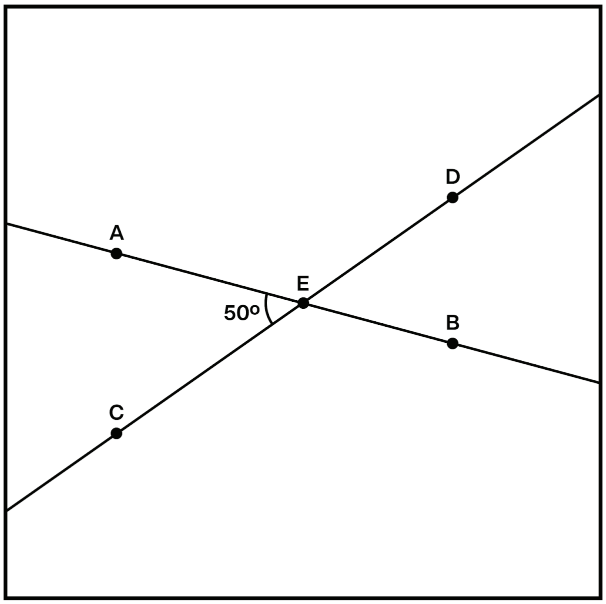
3.3 What kind of quadrilateral is $ABCD$?

Problem 4

Lines AB and CD intersect at E.

4.1 What is the measure of angle AED?

Explain your thinking.



4.2 What is the measure of angle DEB?

Explain your thinking.

 Name ______________________________

Problem 5

Is it possible to draw a triangle with these measurements? Explain your thinking.

5.1 Side lengths 2 cm, 3 cm, and 4 cm

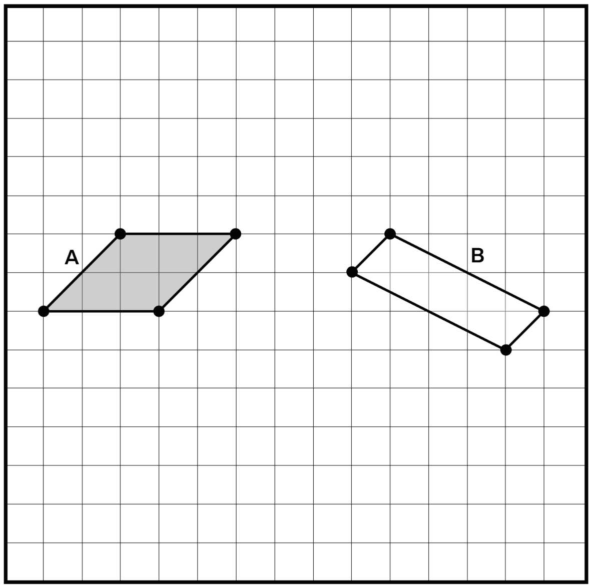
5.2 Side lengths 2 cm, 3 cm, and 6 cm

5.3 Angles $90°$, $45°$, and $45°$

5.4 Angles $90°$, $60°$, and $60°$

Problem 6

6.1 Find the area of parallelogram A.

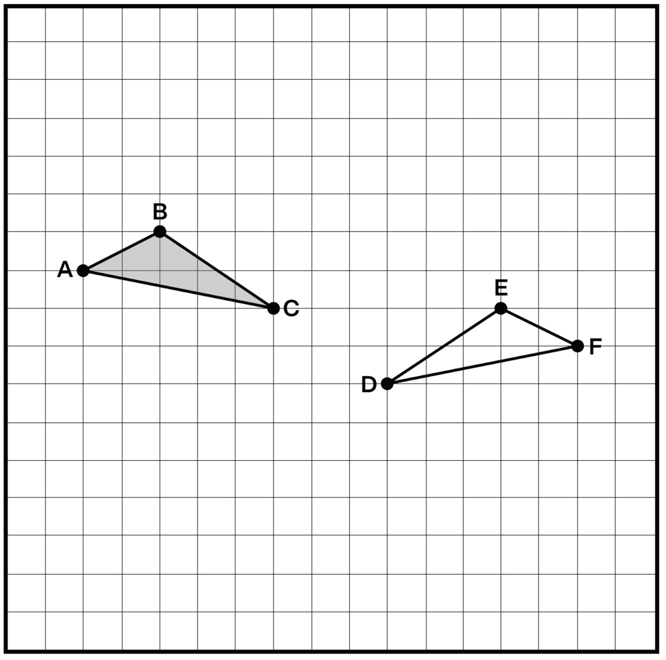


6.2 Find the area of parallelogram B.

Problem 7

Here are two triangles.

Describe a way to move triangle ABC so that it matches up perfectly with triangle FED.



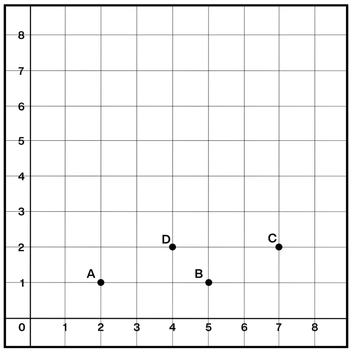
Answer Key

1. B and D

2.1 g

2.2 h

3.1



3.2 3 units

3.3 Parallelogram

4.1 $130°$

Angles AEC and AED are supplementary, so their measures add up to $180°$.

4.2 $50°$

Angles AEC and DEB are vertical angles, so they have the same measure.

5.1 Yes. *Responses vary.*

5.2 No. *Responses vary.*

5.3 Yes. *Responses vary.*

5.4 No. *Responses vary.*

6.1 6 square units

6.2 6 square units

7. *Responses vary.* Triangle ABC can be moved down 2 units and then flipped over a vertical line that lies halfway between the two triangles.

Unit 8.1, Readiness Check Summary

For teachers who choose to spread out the questions, consider assigning the following:

- Problems 1 and 7 before Lesson 1
- Problem 3 before Lesson 5
- Problem 6 before Lesson 8
- Problems 2, 4, and 5 before Lesson 10

Problem 1

(Standard: **8.G.A.1**)

This question is intended to surface students' understanding of what rotations are. If students can answer this question correctly, then they already have a good intuition for rigid motions in the plane. This content first appears in Lesson 1: Transformers.

Suggested Next Steps:

- If students do well, it may be possible to move more quickly through Lessons 1 and 2.
- If students struggle, consider reviewing the definition of *rotation* after Lesson 2 and revisiting this problem. Encourage students to use the sketch tool if it helps them with their thinking.

Problem 2

(Standards: **4.G.A.1, MP7**)

This question is intended to surface students' understanding of parallel and perpendicular lines. Students make use of structure as they classify lines as either parallel or perpendicular. This content first appears in Lesson 10: Transforming Angles.

Suggested Next Steps: If students struggle . . .

- Plan to use the Warm-Up in Lesson 4 as a chance to review the term *parallel* using the isometric grid.
- Consider using Screen 10 of Lesson 5 as an opportunity to review the term *perpendicular*.

Problem 3

(Standards: **5.G.A.1, 6.G.A.3, MP7**)

This question is intended to surface whether students can successfully plot points on a coordinate grid and make use of the grid structure to find distances between points sharing the same x-coordinate or the same y-coordinate. The last part of the problem assesses whether students can identify a parallelogram. This content first appears in Lesson 5: Getting Coordinated.

Suggested Next Steps: If students struggle . . .

- Plan to revisit this problem as part of the Warm-Up for Lesson 5 to review the coordinate plane and to consider how to describe transformations on the coordinate plane.

Problem 4

(Standards: **7.G.B.5, MP7**)

This question is intended to surface what students know about calculating angle measures. This question also surfaces what students know about the terms *vertical* and *supplementary*. Students must make use of structure to determine a missing angle measure. This content first appears in Lesson 10: Transforming Angles.

Suggested Next Steps: If students struggle . . .

- Plan to use Screen 3 of Lesson 10 to review supplementary and vertical angles, making those terms explicit during discussion.

Problem 5

(Standards: **7.G.A.2, MP3**)

This question is intended to surface what students already know about triangle properties. In Math 7, students investigated whether it was possible to draw a triangle given a set of three conditions, but did not learn that the sum of the interior angles of a triangle is $180°$. Students must construct a viable argument as to whether or not a triangle can be created from the given properties. This content first appears in Lesson 11: Tearing It Up.

Suggested Next Steps:

- If students do well, it may be possible to move more quickly through Lesson 11.
- If students struggle, plan to use the Warm-Up of Lesson 11 to ensure that students understand the meaning of triangle side lengths and angle measures.

Problem 6

(Standards: **6.G.A.1, MP7**)

This question is intended to surface what students already know about finding the area of parallelograms using a grid. Students make use of the grid structure to reason quantitatively about the area of parallelograms. This content first appears in Lesson 8: No Bending, No Stretching.

Suggested Next Steps: If students struggle . . .

- Plan to use the Lesson 8 paper supplement to explore and review the relationship between strategies for finding the area of a triangle and strategies for finding the area of polygons on a grid; this skill will be more important in Unit 8.

Problem 7

(Standards: **8.G.A.2, MP3, MP7**)

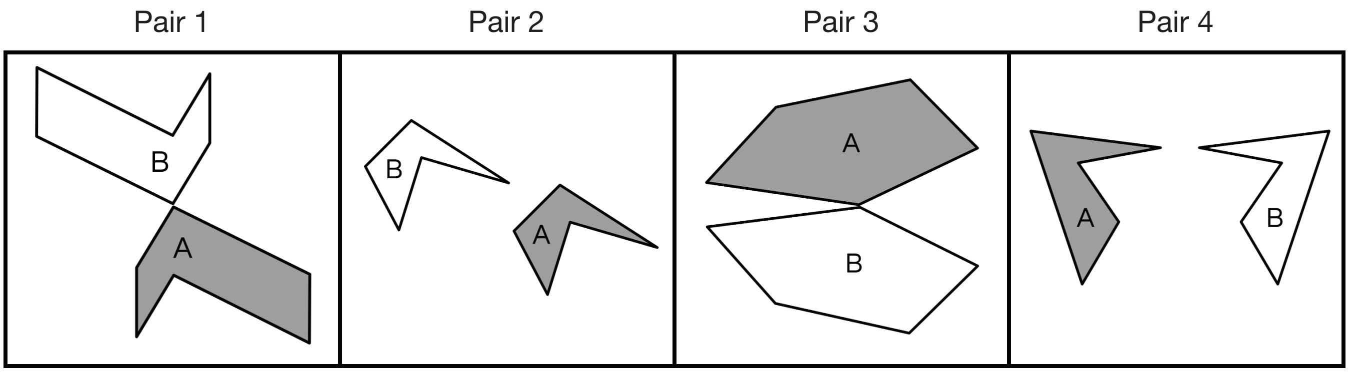
This question is intended to surface students' ability to describe how to move one shape onto another. Students must use the structure of the grid to construct a viable sequence of transformations to take one shape onto the other. This content first appears in Lesson 3: Transformation Golf.

Suggested Next Steps:

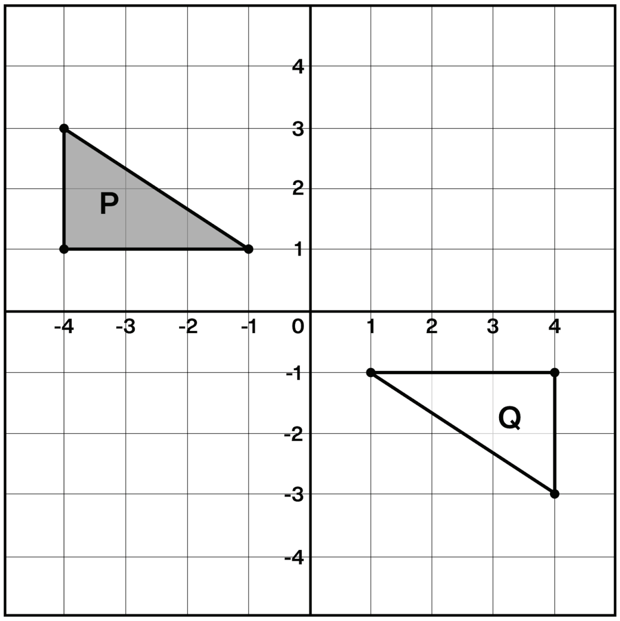
- If students do well, it may be possible to move more quickly through Lessons 1 and 2.
- If students struggle, consider reviewing the transformations *rotation*, *translation*, and *reflection* after Lesson 3 and revisiting this problem. Encourage students to use the sketch tool if it helps them with their thinking.

Unit 8.1, Quiz 1: Lessons 1–6 Name ______________________________

1. In which pair of figures can figure A be taken to figure B by a rotation?



2. Select **all** the sequences of transformations that could take figure P to figure Q.



A. A single reflection

B. A single rotation

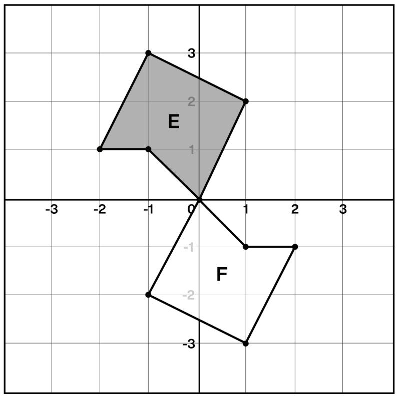
C. A single translation

D. A translation and then a reflection

E. A reflection and then a different reflection

3. Here are three pairs of figures.

3.1 Which transformation takes figure E to figure F?

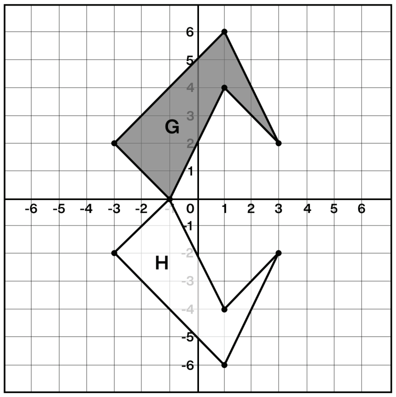


A. Translation

B. Rotation

C. Reflection

3.2 Which transformation takes figure G to figure H?

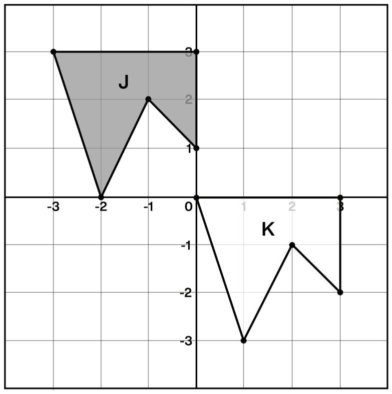


A. Translation

B. Rotation

C. Reflection

3.3 Which transformation takes figure J to figure K?

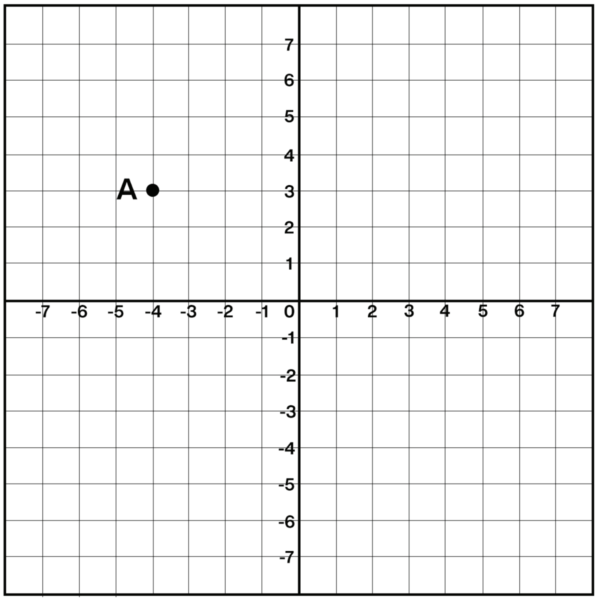


A. Translation

B. Rotation

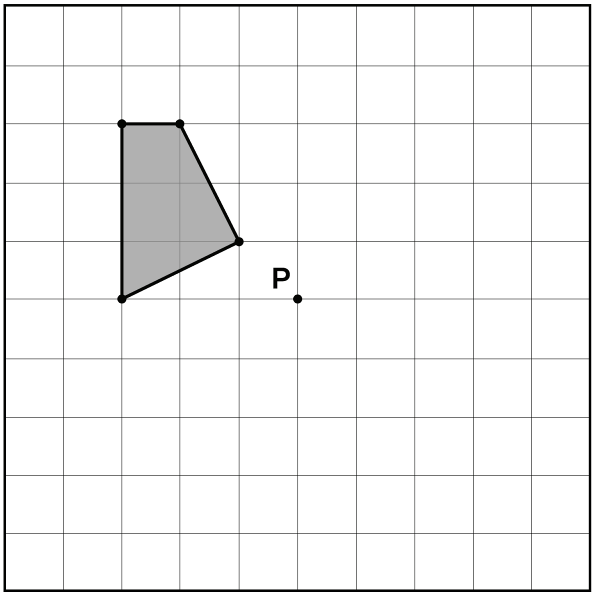
C. Reflection

4. Point A is located at coordinates $(-4, 3)$. What are the coordinates of each point described in the table?

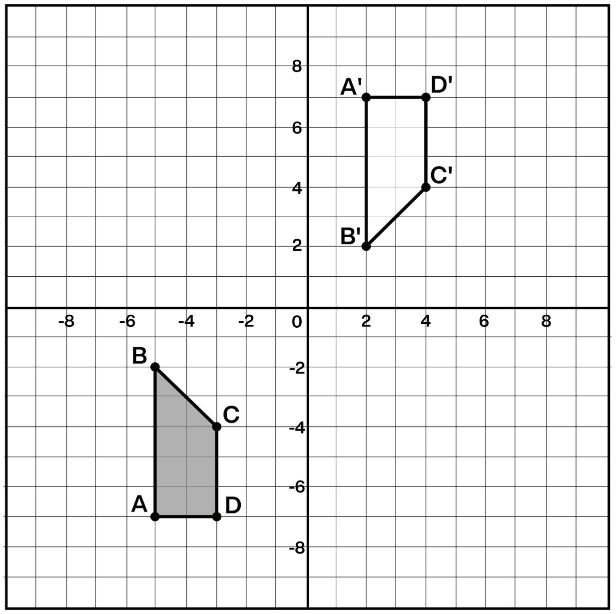


Point	Description	Coordinates
B	The image of A after a rotation of 180° using $(0, 0)$ as the center.	
C	The image of A after a translation 2 units to the right and then a reflection using the x-axis.	
D	The image of A after a reflection using the y-axis. Then a translation 2 units to the right.	

5. Draw the image of this figure under a $90°$ clockwise rotation using center P.



6. Describe a sequence of transformations that takes $ABCD$ to $A'B'C'D'$.



Unit 8.1, Quiz 1: Lessons 1–6

Answer Key

1. Pair 1

2. B and E

3.1 B

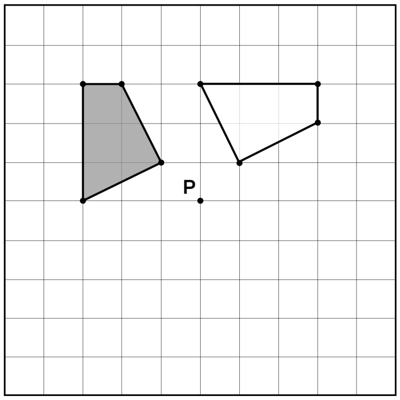
3.2 C

3.3 A

4.

Point	Description	Coordinates
B	The image of A after a rotation of 180° using $(0, 0)$ as the center.	$(4, -3)$
C	The image of A after a translation 2 units to the right and then a reflection using the x-axis.	$(-2, -3)$
D	The image of A after a reflection using the y-axis. Then a translation 2 units to the right.	$(6, 3)$

5.



6. *Responses vary.* Reflect $ABCD$ over the x-axis. Then translate right 7 units.

Unit 8.1, Quiz 1: Summary and Rubric

Content Standards Summary

Standard	8.G.A.1	8.G.A.1.A	8.G.A.3
Problems	1, 2, 3, 6	5	4

Problem 1

(Standard: **8.G.A.1**)

In this problem, students recognize the properties of rotations. This problem corresponds most directly to the work students did in Lesson 2: Spinning, Flipping, Sliding.

Suggested Next Steps: If students struggle . . .

- Consider asking students to rotate each figure A so that only one corresponding point aligns to figure B, then assess whether the figures align entirely.
- Consider revisiting Lesson 2, Activity 2.

Problem 2

(Standards: **8.G.A.1, MP1**)

In this problem, students identify which sequences of transformations take one figure to another in a coordinate plane. Students must analyze the given transformations and decide if different approaches can lead to the same outcome. This problem corresponds most directly to the work students did in Lesson 4: Moving Day.

Suggested Next Steps: If students struggle . . .

- Consider defining certain elements of the transformation for them to get started. For example, helping them choose an appropriate line of reflection or center of rotation.
- Consider revisiting Lesson 4, Activity 1.

Problem 3

(Standard: **8.G.A.1**)

In this problem, students recognize which transformations take one figure to another in a coordinate plane. This problem corresponds most directly to the work students did in Lesson 3: Transformation Golf.

Suggested Next Steps: If students struggle . . .

- Consider reviewing the definition of each transformation, and asking students to perform each transformation to determine their answer by example (or by process of elimination).
- Consider revisiting Lesson 3, Activity 1.

Problem 4

(Standards: **8.G.A.3, MP7**)

In this problem, students describe the effect of a transformation on a coordinate pair. Students must use the structure of the grid to reason about the effect of transformations on a point in the coordinate grid. This problem corresponds most directly to the work students did in Lesson 5: Getting Coordinated.

Suggested Next Steps: If students struggle . . .

- Consider having students transform the point visually first, then having them identify the coordinates of the transformed point.
- Consider revisiting Lesson 5, Activity 2.

Unit 8.1, Quiz 1: Summary and Rubric

Problem 5

(Standard: **8.G.A.1.A**)

In this problem, students draw the image of a figure after a rotation. This problem corresponds most directly to the work students did in Lesson 4: Moving Day.

Suggested Next Steps: If students struggle . . .

- Consider having students transform only one point at a time, then having them connect the transformed points to form the transformed shape.
- Consider revisiting Lesson 4, Activity 1.

Problem 6

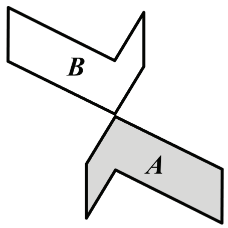
(Standards: **8.G.A.1, MP1, MP7**)

In this problem, students describe a sequence of transformations that take one figure to another in a coordinate plane. Students must use the structure of the coordinate grid to define their own sequence of transformations, and could possibly determine many such sequences that transform the figure correctly. This problem corresponds most directly to the work students did in Lesson 6: Connecting the Dots.

Suggested Next Steps: If students struggle . . .

- Consider working through one sequence of transformations with students to get them started, then asking them to create a different sequence of transformations for their response.
- Consider revisiting Lesson 6, Activity 1.

Unit 8.1, Quiz 1: Summary and Rubric

Problem	Standard	Meeting/Exceeding	Approaching	Developing	Beginning	
		4	3	2	1	0
1	8.G.A.1	• Pair 1 			• Pair 3 Student may have confused rotations and reflections. Student may believe the common point between the two figures is the center of a $180°$ rotation.	Did not attempt.
2	8.G.A.1, MP1	Student selects all of the correct choices and does not select any incorrect choices. • A single rotation • A reflection and then a different reflection	Student selects one of the correct choices and does not select any incorrect choices. Student selects both of the correct choices and one incorrect choice.	Student selects one or two of the correct choices but also includes an incorrect choice.	Student selects only incorrect choices. Student selects two or more incorrect choices with some correct choices.	Did not attempt.
3.1	8.G.A.1	• Rotation			• Reflection Student may have confused reflection and rotation.	Did not attempt.
3.2	8.G.A.1	• Reflection			• Rotation Student may have confused reflection and rotation.	
3.3	8.G.A.1	• Translation			• Reflection or rotation Student may need more support understanding transformations.	

Unit 8.1, Quiz 1: Summary and Rubric

Problem	Standard	Meeting/Exceeding	Approaching	Developing	Beginning	
		4	**3**	**2**	**1**	**0**
4.1	8.G.A.3, MP7	Response is complete and correct. • $(4, -3)$	Work shows conceptual understanding and mastery, with minor errors. Student sketches the correct point, but writes the coordinate incorrectly.	Work shows a developing but incomplete conceptual understanding, with significant errors. • $(-4, -3)$, $(4, 3)$, or $(-4, 3)$ Student may need support writing the coordinates of a point.	Weak evidence of understanding.	Did not attempt.
4.2	8.G.A.3, MP7	Response is complete and correct. • $(-2, -3)$	Work shows conceptual understanding and mastery, with minor errors. Student sketches the correct point, but writes the coordinate incorrectly. • $(2, 3)$ Student may have translated correctly, but reflected over the y-axis.	Work shows a developing but incomplete conceptual understanding, with significant errors. • $(-4, -3)$ Student may have reflected correctly, but did not translate. • $(-2, 3)$ Student may have translated correctly, but did not reflect.	Weak evidence of understanding.	Did not attempt.

Unit 8.1, Quiz 1: Summary and Rubric

Problem	Standard	Meeting/Exceeding	Approaching	Developing	Beginning	
		4	3	2	1	0
4.3	8.G.A.3, MP7	Response is complete and correct. • $(6, 3)$	Work shows conceptual understanding and mastery, with minor errors. Student sketches the correct point, but writes the coordinate incorrectly. • $(2, 3)$ Student may have translated first, then reflected. • $(-2, -3)$ Student may have translated correctly, but reflected over the x-axis.	Work shows a developing but incomplete conceptual understanding, with significant errors. • $(4, 3)$ Student may have reflected correctly, but did not translate. • $(-2, 3)$ Student may have translated correctly, but did not reflect.	Weak evidence of understanding.	Did not attempt.
5	8.G.A.1.A	Response is complete and correct.	Work shows general conceptual understanding and mastery, with some errors.	Work shows a developing but incomplete conceptual understanding, with significant errors.	Weak evidence of understanding.	Did not attempt.
6	8.G.A.1, MP1, MP7	Response references a reflection across the x -axis and a translation with direction and distance. • Reflect $ABCD$ over the x-axis. Then translate right 7 units.	Work shows conceptual understanding and mastery, with minor errors. Students who reference a reflection and translation to the left may have confused the image and pre-image.	Work shows a developing but incomplete conceptual understanding, with significant errors. • Reflect then translate.	Weak evidence of understanding.	Did not attempt.

Unit 8.1, Quiz 2: Lessons 7–9 Name ______________________________

You will need a geometry toolkit for this assessment.

1. Which statement describes two figures that are **always** congruent?

   A. Two rectangles that have the same area.

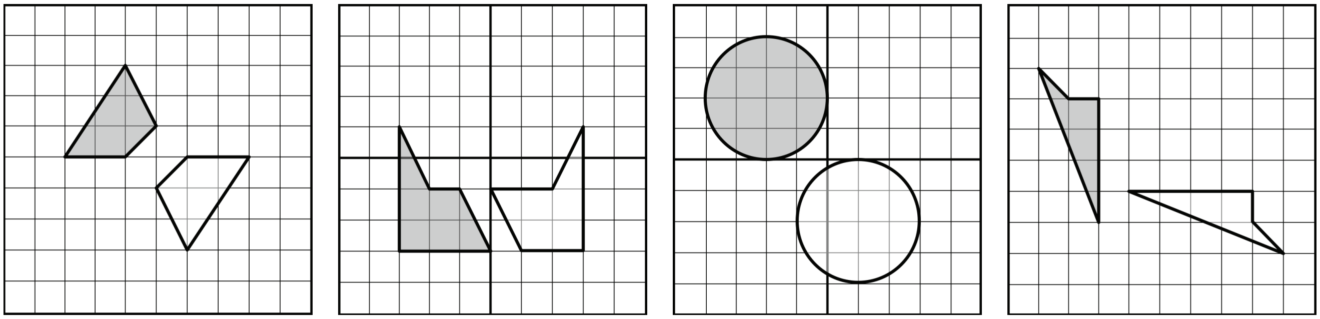
   B. Two line segments that each measure 8 units.

   C. Two quadrilaterals in which all side lengths measure 4 units.

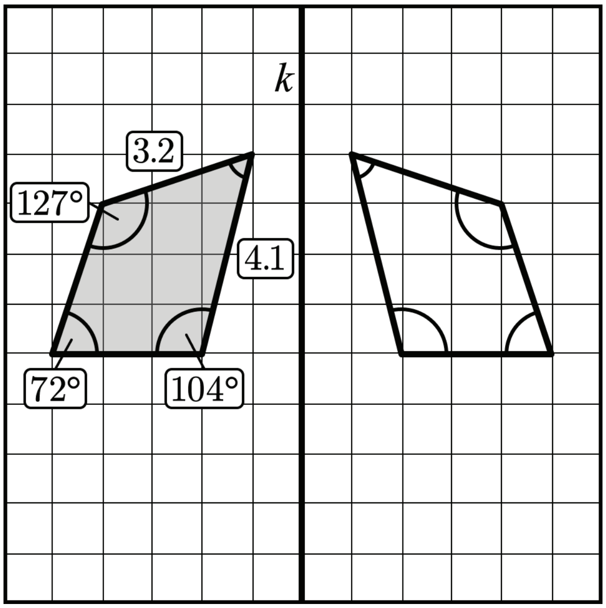
   D. Two triangles that have the same perimeter.

2. Circle **all** of the pairs of congruent figures.

Pair 1 Pair 2 Pair 3 Pair 4

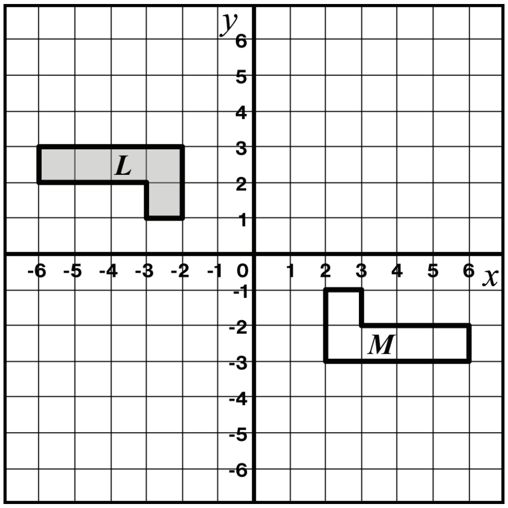


3. The pre-image on the left is reflected across line k to form the image on the right. Use the information in the original figure to label the corresponding parts in the image. (Length measures are in grid units.)

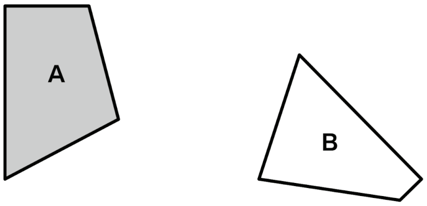


 Name ____________________________________

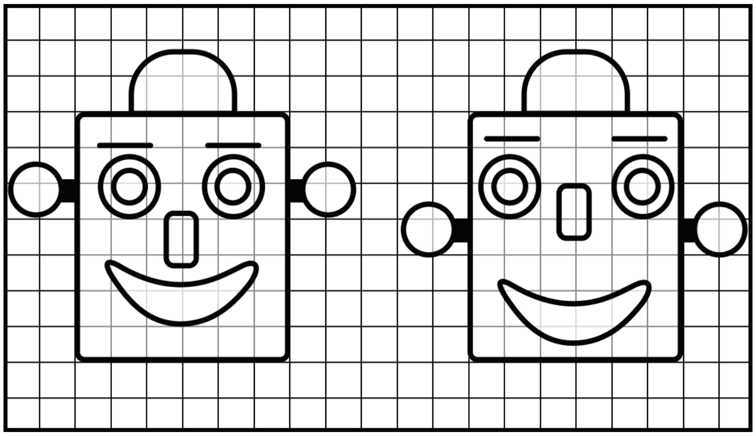
4. Describe a sequence of transformations to show that polygon L is congruent to polygon M.



5. Explain why figure B cannot be the image of figure A after a rotation.



6. Are these figures congruent? Explain your thinking.

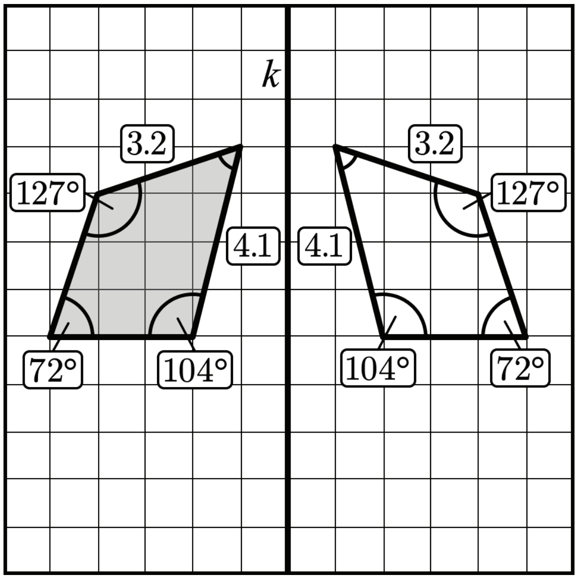


Answer Key

1. B. Two line segments that each measure 8 units

2. Pair 1, Pair 3, Pair 4

3.



4. *Responses vary.* If polygon M is reflected across the x-axis and then reflected across the y-axis, it matches up perfectly with polygon L.

5. *Responses vary.* The shortest side of figure B is shorter than the shortest side of figure A. Since rotations do not change lengths, figure B is not a rotation of figure A.

6. No.

   Responses vary. While the individual parts are congruent, the robots as wholes are not. In the robot on the right, the eyes are 2 units apart. For the robot on the left, they are less than 2 units apart. The ears on the right robot are 1 unit lower than those on the left robot. The mouth on the left is also higher than the mouth on the right, and the nose on the left is lower than the nose on the right. Any one of these differences is enough to determine that the robots are not congruent.

Unit 8.1, Quiz 2: Summary and Rubric

Content Standards Summary

Standard	8.G.A.1	8.G.A.1.A	8.G.A.1.B	8.G.A.2
Problems	5	1, 3	3	2, 4, 6

Problem 1

(Standard: **8.G.A.1.A**)

In this problem, students identify the properties of congruent figures. This problem corresponds most directly to the work students did in
Lesson 9: Are They Congruent?

Suggested Next Steps: If students struggle . . .

- Consider having students try to construct two non-congruent figures with the given properties, then give their answer based on the process of elimination.
- Consider revisiting Lesson 9, Activity 2.

Problem 2

(Standards: **8.G.A.2, MP7**)

In this problem, students identify congruent figures using lengths and angles. Students may use the structure of the grid and their knowledge of rigid transformations to convince themselves that two figures are congruent. This problem corresponds most directly to the work students did in Lesson 7: Are They the Same?

Suggested Next Steps: If students struggle . . .

- Consider suggesting measurements for students to record and compare between pairs of figures, then asking them to use transformations to attempt to align the figures if the measurements are the same.
- Consider revisiting Lesson 7, Activity 2.

Unit 8.1, Quiz 2: Summary and Rubric

Problem 3

(Standards: **8.G.A.1.A, 8.G.A.1.B, MP7**)

In this problem, students determine the effect of a reflection on angle measures. Students use the structure of the grid and the figure to properly label quantities on the reflected image. This problem corresponds most directly to the work students did in Lesson 8: No Bending,
No Stretching.

Suggested Next Steps: If students struggle . . .

- Consider having students transform one point at a time and labeling the angle associated with that point before moving on to the others.
- Consider revisiting Lesson 8, Activity 2.

Problem 4

(Standards: **8.G.A.2, MP3, MP7**)

In this problem, students justify why two figures are congruent using the language of transformations. Students must use the structure of the grid to construct a viable sequence of transformations that shows the figures are congruent. This problem corresponds most directly to the work students did in Lesson 9: Are They Congruent?

Suggested Next Steps: If students struggle . . .

- Consider helping students get started by showing them a valid sequence of transformation, then having them record a different sequence of transformation for their response.
- Consider revisiting Lesson 9, Activity 2.

Unit 8.1, Quiz 2: Summary and Rubric

Problem 5

(Standards: **8.G.A.1, MP3**)

In this problem, students apply the properties of rotations to explain why one figure cannot be the image of another after a rotation. Students must construct a viable argument using properties of the figures and the transformation to support their answer.
This problem corresponds most directly to the work students did in Lesson 3: Transformation Golf.

Suggested Next Steps: If students struggle . . .

- Consider showing students how to use the tracing paper tool to compare the two figures directly on top of each other, then asking them to write specific differences they notice.
- Consider revisiting Lesson 3, Activity 1.

Problem 6

(Standards: **8.G.A.2, MP3, MP7**)

In this problem, students justify whether or not two figures are congruent. Students must use the structure of the grid and their understanding of congruence to construct a viable argument to support their answer. This problem corresponds most directly to the work students did in Lesson 9: Are They Congruent?

Suggested Next Steps: If students struggle . . .

- Consider helping students focus on the space in between individual features rather than comparing each feature directly.
- Consider revisiting Lesson 9, Activity 2.

Unit 8.1, Quiz 2: Summary and Rubric

Problem	Standard	Meeting/Exceeding	Approaching	Developing	Beginning	
		4	3	2	1	0
1	8.G.A.1.A	• Two line segments that each measure 8 units.			• Two polygons in which all side lengths measure 4 units. Student may have thought this meant that each of the polygons must have the same shape.	Did not attempt.
2	8.G.A.2, MP7	Student selects all of the correct choices and does not select any incorrect choices. • Pair 1 • Pair 3 • Pair 4	Student selects one or two of the correct choices and does not select any incorrect choices.	Student selects one or two of the correct choices but also includes an incorrect choice.	Student selects only incorrect choices.	Did not attempt.
3	8.G.A.1.A, 8.G.A.1.B, MP7	Work is complete and correct.	Work shows conceptual understanding and mastery, with minor errors. • Student correctly labels four of the five measurements.	Work shows a developing but incomplete conceptual understanding, with significant errors. • Student correctly labels two or three of the five measurements.	Weak evidence of understanding. • Student correctly labels one of the five measurements.	Did not attempt.

Unit 8.1, Quiz 2: Summary and Rubric

Problem	Standard	Meeting/Exceeding	Approaching	Developing	Beginning	
		4	3	2	1	0
4	8.G.A.2, MP3, MP7	Student mentions translations, rotations, and/or reflections with enough specificity to reproduce and align the polygons. ● If polygon L is reflected across the x-axis and then reflected across the y-axis, it matches up perfectly with polygon M.	Student mentions transformations, but not specifics. ● You would have to rotate it for the polygons to overlap.	Student mentions incorrect transformations. ● Translate the polygon.	Student does not mention transformations. ● They are congruent because they have the same shape.	Did not attempt.
5	8.G.A.1, MP3	Response is complete and correct. ● The shortest side of polygon B is shorter than the shortest side of polygon A. Since rotations do not change lengths, polygon B is not a rotation of polygon A.	Work shows general conceptual understanding and mastery, with some errors. Student states that the lengths are not the same but does not discuss rotations.	Work shows a developing but incomplete conceptual understanding, with significant errors.	Weak evidence of understanding.	Did not attempt.
6	8.G.A.2, MP3, MP7	Student successfully answers the question and includes a logical and complete explanation. ● No. While the individual parts are congruent, the figures as wholes are not. For the robot on the right, the eyes are 2 units apart. For the robot on the left, they are less than 2 units apart.	Correct answer with minor flaws in explanation. Incorrect answer with logical and complete explanation.	Correct answer with incomplete explanation. Incorrect answer with explanation that communicates partial understanding.	Incorrect answer with incorrect explanation or without an explanation.	Did not attempt.

Unit 8.1, End-Unit Assessment: Form A Name ___________________________

You will need a geometry toolkit for this assessment.

1. The point $(1, -3)$ is shown on the graph.

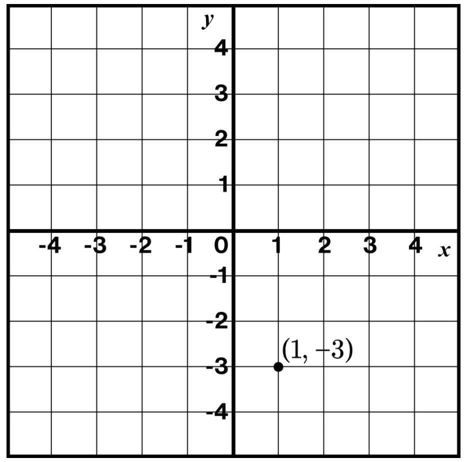
   What are the coordinates of the point after a reflection using the x-axis?

   A. $(-1, -3)$

   B. $(1, 3)$

   C. $(3, -1)$

   D. $(-3, 1)$



2. Which of these sequences of transformations does **not** return a shape to its original position?

   A. Translate 3 units up, then 3 units down.

   B. Reflect over line p, then reflect over line p again.

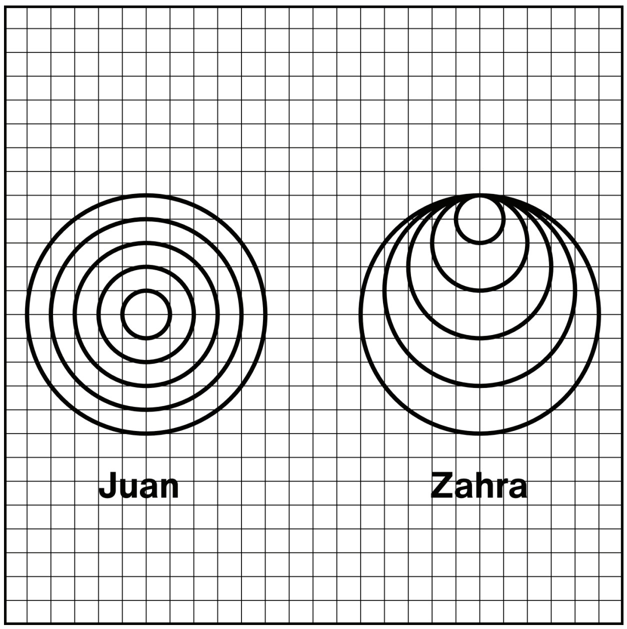
   C. Translate 1 unit to the right, then 4 units to the left, then 3 units to the right.

   D. Rotate $120°$ counterclockwise around center C. Then rotate $120°$ counterclockwise around C again.

3. Juan and Zahra each made a design using 5 circles.

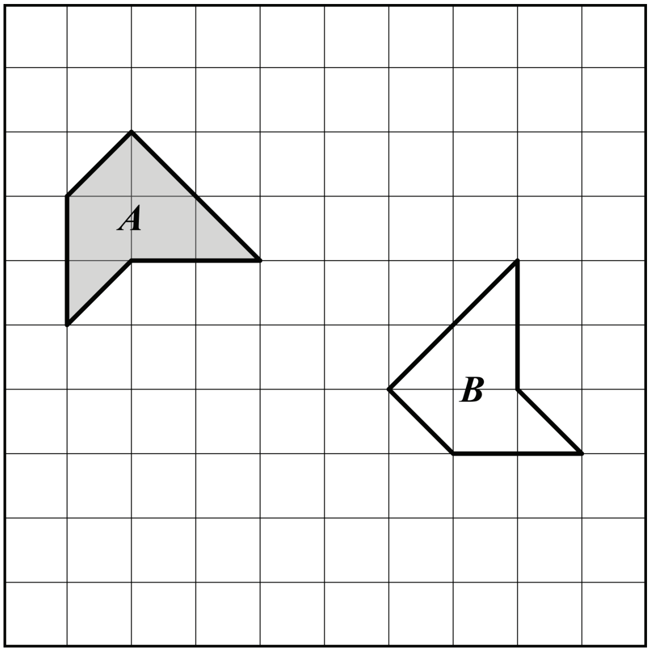
   Select **all** of the true statements.

   - ☐ The smallest circle in Juan's design is congruent to the smallest circle in Zahra's design.
   - ☐ Juan's design is congruent to Zahra's design.
   - ☐ If you translate Juan's design 14 units to the right, you get Zahra's design.
   - ☐ Each circle in Juan's design has a congruent circle in Zahra's design.



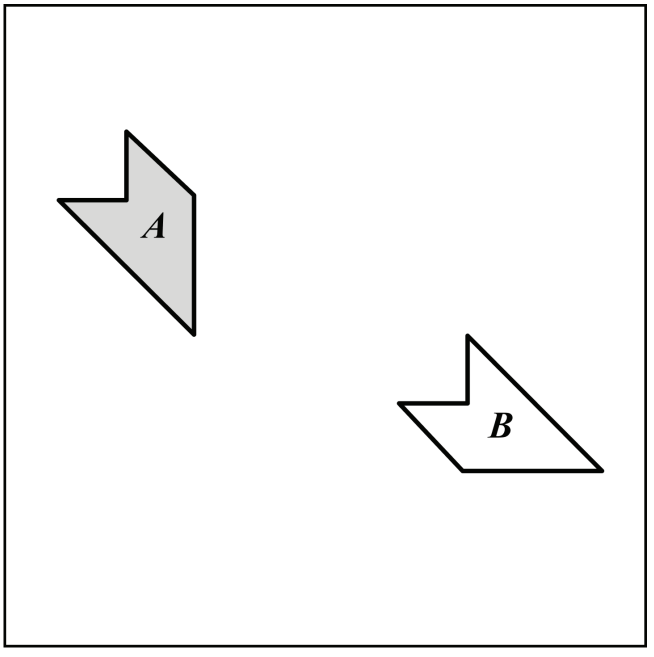
 Name ______________________________

4. Use translations, rotations, and/or reflections to explain how you know that polygon A is congruent to polygon B.



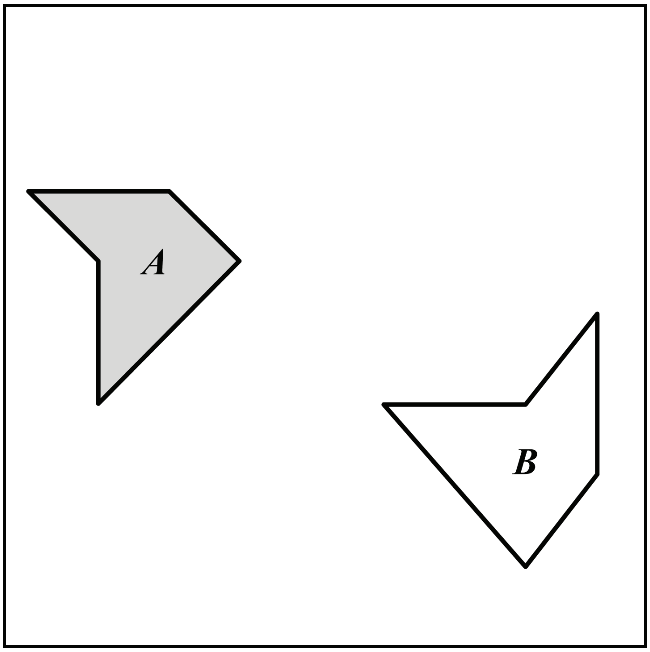
5.1 Is shape A congruent to shape B?

Explain your reasoning using translations, rotations, and/or reflections.

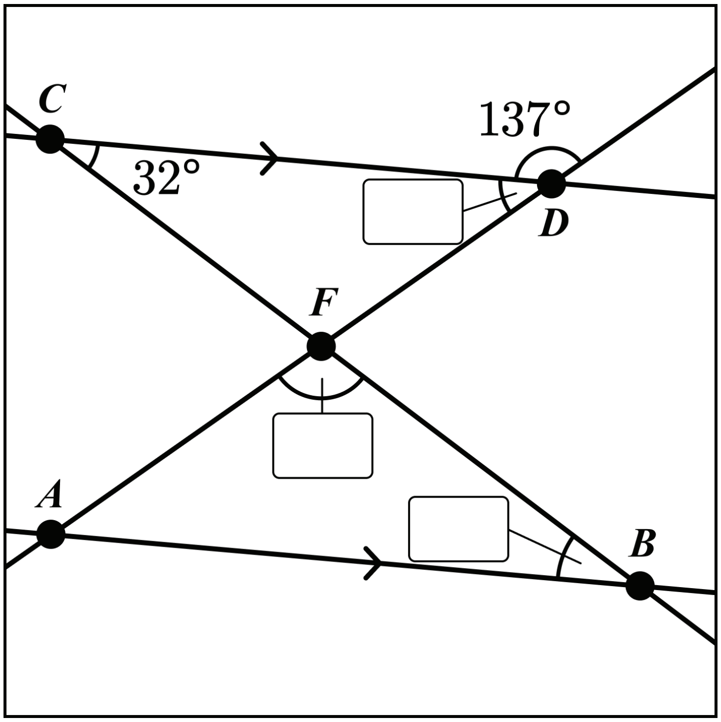


5.2 Is shape A congruent to shape B?

Explain your reasoning using translations, rotations, and/or reflections.



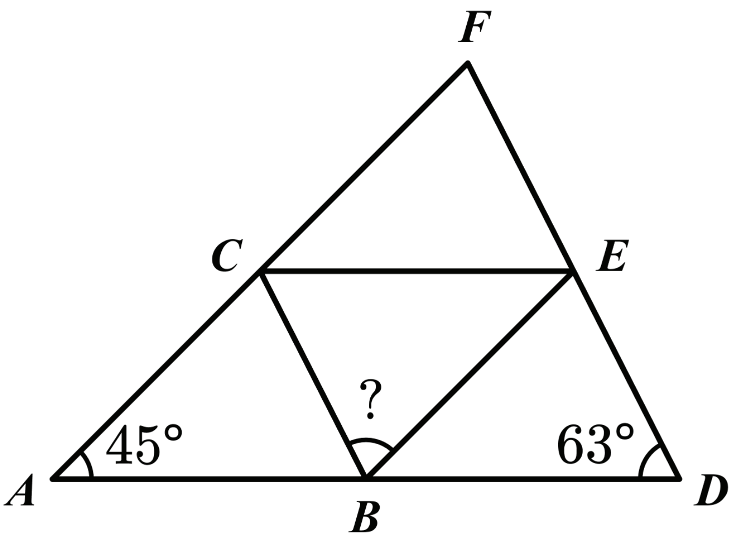
6. Lines AB and CD are parallel. Determine the measures of the three angles in the diagram.



Unit 8.1, End-Unit Assessment: Form A Name ______________________________

To create this diagram:

- Triangle ABC was translated so that A goes to C.
- Then triangle ABC was translated so that A goes to B.



7.1 Identify at least **two pairs of congruent angles** in the figure. Explain how you know they are congruent.

7.2 Name a triangle that is congruent to triangle CBE.

7.3 What is the measure of angle CBE? Explain or show your thinking.

Unit 8.1, End-Unit Assessment: Form A Name ________________________________

Reflection: Select a question to answer.

☐ What is something you are proud of from this unit?

☐ Write what you know about a topic from this unit that you weren't asked about today.

☐ Describe or show one strategy you found helpful in this unit.
Name any students who helped you with this strategy.

☐ What else would you like your teacher to know?

1. B

2. D

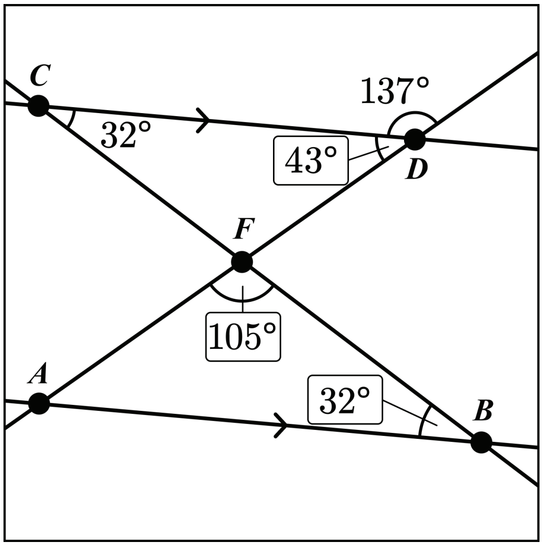
3. ✓ The smallest circle in Juan's design is congruent to the smallest circle in Zahra's design.
✓ Each circle in Juan's design has a congruent circle in Zahra's design.

4. *Responses vary.* If polygon A is rotated $90°$ counterclockwise around its far right point and then translated 4 units to the right, it matches up perfectly with polygon B.

5.1 Yes. *Explanations vary.* I can reflect shape A, rotate it, and then translate it onto shape B.

5.2 No. *Explanations vary.* The shapes look congruent, but when shape A is moved on top of shape B with a $90°$ clockwise rotation and a translation, they do not match up.

6.



7.1 *Responses vary.* Angle ABC is congruent to angle CEF and angle BDE because triangle ABC is congruent to triangle CEF and triangle BDE, and corresponding angles in congruent figures have the same measure.

7.2 *Responses vary.*

- Triangle EFC
- Triangle BCA
- Triangle DEB

7.3 $72°$. *Explanations vary.* The three angles with vertices at B must total $180°$ since they make a line. I know that angle EBD is the same measure as angle A, $45°$, and angle ABC is the same measure as angle D, $63°$. Angle CBE must be $180° - 45° - 63° = 72°$.

Unit 8.1, End Assessment Summary and Rubric: Form A

Content Standards Summary

Standard	8.G.A.1	8.G.A.1.A	8.G.A.1.B	8.G.A.2	8.G.A.3	8.G.A.5
Problems	2	3	7.2	4, 5	1	6, 7.1, 7.3

Problem 1

(Standards: **8.G.A.3, MP7**)

In this problem, students recognize the effect of a reflection on a single point in the coordinate plane. Students make use of the structure of the grid to transform the point and accurately record its coordinates. This problem corresponds most directly to the work students did in Lesson 5: Getting Coordinated.

Suggested Next Steps: If students struggle . . .

- Consider reviewing the definition of *reflection* as it relates to an axis to ensure that students comprehend the question.
- Consider revisiting Lesson 5, Activity 2.

Problem 2

(Standard: **8.G.A.1**)

In this problem, students demonstrate their understanding of transformations that carry a figure onto itself. This problem corresponds most directly to the work students did in Lesson 3: Transformation Golf.

Suggested Next Steps: If students struggle . . .

- Consider having students use the sketch tools to perform the transformations.
- Consider revisiting Lesson 3, Activity 1.

Unit 8.1, End Assessment Summary and Rubric: Form A

Problem 3

(Standards: **8.G.A.1.A, MP3**)

In this problem, students recognize that distances between all pairs of corresponding points of congruent figures are the same. It is not enough that the individual parts of complex shapes are congruent; they also need to be in the same position relative to one another. Students must critique given statements to determine whether or not they are correct. This problem corresponds most directly to the work students did in Lesson 9: Are They Congruent?

Suggested Next Steps: If students struggle . . .

- Consider drawing students' attention to the space in between parts of each design rather than comparing each component directly.
- Consider revisiting Lesson 9, Activity 2.

Problem 4

(Standards: **8.G.A.2, MP3, MP7**)

In this problem, students use rigid transformations to show multistep congruence on a grid. Students use the structure of the grid to construct a viable sequence of transformations that takes one figure onto the other. This problem corresponds most directly to the work students did in Lesson 9: Are They Congruent?

Suggested Next Steps: If students struggle . . .

- Consider asking students to determine which parts of the figures correspond to each other, such as a particular vertex, then determine a sequence of transformations that takes the corresponding part to its image. Distribute the digital supplement if it helps students with their thinking.
- Consider revisiting Lesson 9, Activity 2.

Unit 8.1, End Assessment Summary and Rubric: Form A

Problem 5

(Standards: **8.G.A.2, MP1**)

In this problem, students determine if two shapes are congruent without the use of a grid. Students must persevere to find a sequence of transformations that shows the shapes are congruent, or determine a reason why the shapes cannot be congruent. This problem corresponds most directly to the work students did in Lesson 9: Are They Congruent?

Suggested Next Steps: If students struggle . . .

- Consider having students use the digital tracing paper to try out many different transformations. Help students get started by suggesting they try aligning only one part of the figures as a first step.
- Consider revisiting Lesson 9, Activity 1.

Problem 6

(Standards: **8.G.A.5, MP7**)

In this problem, students use given angle measurements and relationships with parallel lines to find the angles in a triangle. Students make use of the structure of vertical and supplementary angles to reason about angle measures. This problem corresponds most directly to the work students did in Lesson 12: Puzzling It Out.

Suggested Next Steps: If students struggle . . .

- Consider reviewing the terms vertical angles and supplementary angles. Have students identify any triangles they see, and ask them if there is anything special about the total angle measure in a triangle.
- Consider revisiting Lesson 12, Activity 1.

Problem 7

(Standards: **8.G.A.1.B, 8.G.A.5, MP3**)

In this problem, students recognize angle relationships in congruent triangles given a diagram composed of transformed triangles. Students construct viable arguments to justify angle congruence and identify an unknown angle measure. This problem corresponds most directly to the work students did in Lessons 10–12.

Suggested Next Steps: If students struggle . . .

- Consider reviewing the properties of congruent figures, the total interior angle sum of triangles, and the term *supplementary*.
- Consider revisiting Lesson 12, Activity 1.

Unit 8.1, End Assessment Summary and Rubric: Form A

Problem	Standard	Meeting/Exceeding	Approaching	Developing	Beginning	
		4	**3**	**2**	**1**	**0**
1	8.G.A.3, MP7	• $(1, 3)$			• $(-1, -3)$ Student may have reflected over the y-axis instead of the x-axis. • $(3, -1)$ or $(-1, 3)$ Student may have basic misunderstandings about reflections.	Did not attempt.
2	8.G.A.1	• Rotate $120°$ counterclockwise around center C. Then rotate $120°$ counterclockwise around C again.			• Translate 1 unit to the right, then 4 units to the left, then 3 units to the right. Student may not have noticed that the shape moved a total of 4 units to the right and 4 units to the left.	Did not attempt.
3	8.G.A.1.A, MP3	• The smallest circle in Juan's design is congruent to the smallest circle in Zahra's design. • Each circle in Juan's design has a congruent circle in Zahra's design.	Student identifies one of the correct choices, and does not select any incorrect choices.	Student identifies one of the correct choices, but also includes an incorrect choice.	Student only selects incorrect choices. Student selects two or more incorrect choices with the correct choices.	Did not attempt.

Unit 8.1, End Assessment Summary and Rubric: Form A

Problem	Standard	Meeting/Exceeding	Approaching	Developing	Beginning	
		4	3	2	1	0
4	8.G.A.2, MP3, MP7	Student mentions translation and rotation, and enough specifics to reproduce. • Rotate A $90°$ counterclockwise around its far-right point. Then translate 4 units to the right.	Student mentions a translation and/or rotation, but not specifics. • Translate left, then rotate.	Student mentions incorrect transformations. • It was translated and then it was reflected.	Student does not mention any transformations. • They are congruent because they have the same shape.	Did not attempt.
5.1	8.G.A.2, MP1	Student successfully answers the question and includes a logical and complete explanation. • Yes. I can reflect shape A, rotate it, and then translate it onto shape B.	Correct answer with minor flaws in explanation. Incorrect answer with logical and complete explanation.	Correct answer with incomplete explanation. Incorrect answer with explanation that communicates partial understanding.	Incorrect answer with or without incorrect explanation.	Did not attempt.
5.2	8.G.A.2, MP1	Student successfully answers the question and includes a logical and complete explanation. • No. The shapes look congruent, but when shape A is moved on top of shape B with a $90°$ clockwise rotation and a translation, they do not match up.	Correct answer with minor flaws in explanation. Incorrect answer with logical and complete explanation. • No. Shape B is larger than shape A.	Correct answer with incomplete explanation. Incorrect answer with explanation that communicates partial understanding of the situation.	Incorrect answer with or without incorrect explanation.	Did not attempt.

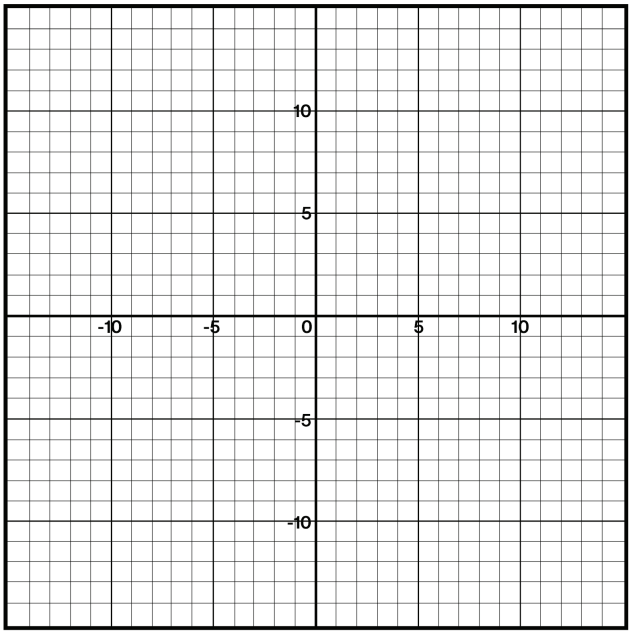
Unit 8.1, End Assessment Summary and Rubric: Form A

Problem	Standard	Meeting/Exceeding	Approaching	Developing	Beginning	
		4	**3**	**2**	**1**	**0**
6	8.G.A.5, MP7	All three angles are correct.	Two out of the three angles are correct.	One out of the three angles is correct.	None of the angles are correct.	Did not attempt.
7.1	8.G.A.5, MP3	Work is complete and correct. • Angle ABC is congruent to angle CEF and angle BDE because triangle ABC is congruent to triangle CEF and triangle BDE, and corresponding angles in congruent figures have the same measure.	Work shows general conceptual understanding and mastery, with some errors. • Angle ABC is congruent to angle CEF and angle BDE.	Work shows a developing but incomplete conceptual understanding, with significant errors. • There are four sets of congruent triangles.	Weak evidence of understanding of congruence.	Did not attempt.
7.2	8.G.A.1.B, MP3	Work is complete and correct. • Triangle EFC, or • Triangle BCA, or • Triangle DEB	Work shows conceptual understanding and mastery, with minor errors.	Work shows a developing but incomplete conceptual understanding, with significant errors.	Weak evidence of understanding.	Did not attempt.

7.3	8.G.A.5, MP3	Student successfully answers the question with a logical and complete explanation. • $72°$. The three angles with vertices at B must total $180°$ since they make a line. Angle EBD is the same measure as angle A, $45°$, and angle ABC is the same measure as angle D, $63°$. Angle CBE must be $180° - 45° - 63° = 72°$.	Correct answer with minor flaws in explanation. Incorrect answer resulting from a minor error in calculation with logical and complete explanation.	Correct answer with incomplete explanation. Incorrect answer with explanation that communicates partial understanding of the situation. • $72°$. The angles must add up to $180°$.	Incorrect answer with or without incorrect explanation.	Did not attempt.

 Name ______________________________

Problem 1

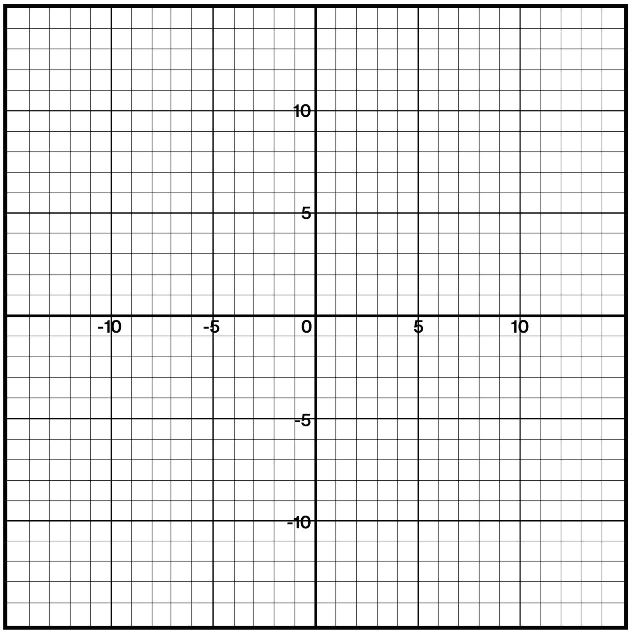


Which of these points is closest to the y-axis?

A. $(-6, 0)$
B. $(-2, 12)$
C. $(4, 2)$
D. $(5, 1)$

Use the coordinate plane if it helps you with your thinking.

Problem 2



Which of these points is closest to the point $(7, 1)$?

A. $(11, 1)$
B. $(4, 1)$
C. $(7, -1)$
D. $(7, 4)$

Use the coordinate plane if it helps you with your thinking.

Problem 3

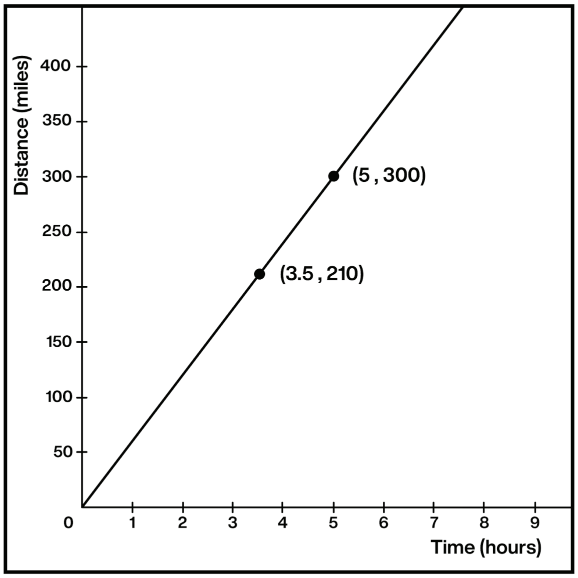
Quantities x and y are in a proportional relationship.

Complete the table.

x	y
4	16
3	
	8

Problem 4

A car traveled at a constant speed. The graph shows how far the car traveled, in miles, during a given amount of time, in hours.



4.1 What does the point $(3.5, 210)$ mean in terms of the car?

4.2 Is the point $(1, 60)$ on this line? Explain your thinking.

Unit 8.2, Readiness Check Name ____________________

Problem 5

Evaluate these expressions:

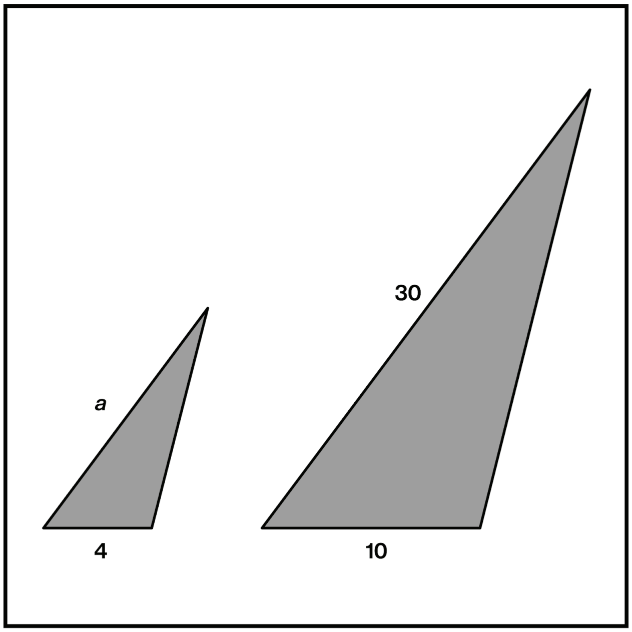
5.1 $4 \div \frac{1}{3}$

5.2 $\frac{3}{8} \div \frac{7}{2}$

5.3 $3\frac{1}{2} \div \frac{7}{4}$

Name ________________________________

Problem 6

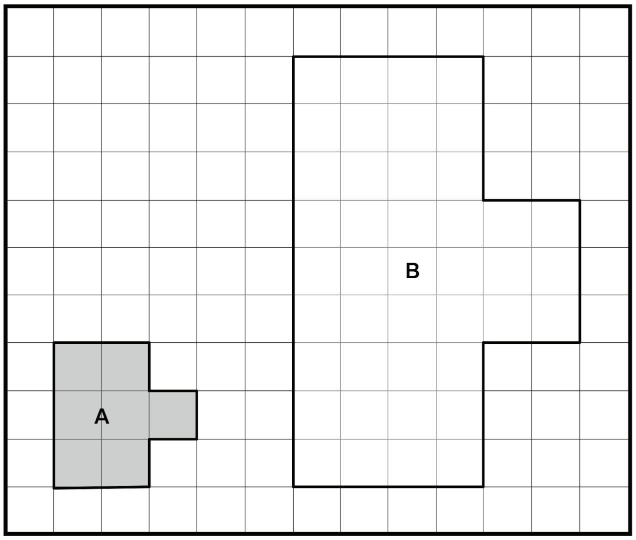


The two triangles displayed are scaled copies of one another.

6.1 What is the scale factor?

6.2 What is the value of a?

Problem 7



Is figure B a scaled copy of figure A? Explain your thinking.

Answer Key

1. B

2. C

3.

x	y
4	16
3	12
2	8

4.1 It means that after 3.5 hours, the car traveled a distance of 210 miles.

4.2 Yes. *Responses vary.*

The car is traveling at a constant speed, and 300 miles in 5 hours means the car travels 60 miles each hour. That means the point $(1, 60)$ is on the graph.

5.1 12 (or equivalent)

5.2 $\frac{3}{28}$ (or equivalent)

5.3 2 (or equivalent)

6.1 $\frac{5}{2}$ or $\frac{2}{5}$ (or equivalent)

6.2 12

6.3 No.

Responses vary. The horizontal segments in figure B are twice as long as the corresponding segments in figure A, and the vertical segments are three times as long.

Unit 8.2, Readiness Check Summary

For teachers who choose to spread out the questions, consider assigning the following:

- Problems 3, 6, and 7 before Lesson 2
- Problems 1 and 2 before Lesson 3
- Problem 5 before Lesson 4
- Problem 4 before Lesson 9

Problem 1

(Standard: **6.NS.C.8**)

This question is intended to surface what students already know about plotting coordinates and the y–axis. This content first appears in Lesson 3: Match My Dilation, where students describe dilations on a coordinate plane.

Suggested Next Steps: If students struggle . . .

- Plan to use this problem and Unit 1, Lesson 5 to review distance on a coordinate grid. Students will have more opportunities to find distances on a coordinate grid in Lesson 4.

Problem 2

(Standard: **6.NS.C.8**)

This question is intended to surface what students already know about distances and locations on the coordinate plane. This content first appears in Lesson 3: Match My Dilation, where students multiply the distance between a point and a center by a scale factor.

Suggested Next Steps: If students struggle . . .

- Plan to launch Lesson 4 by reviewing this problem and the concept of distance on the coordinate plane.

Problem 3

(Standards: **7.RP.A.2, MP7**)

This question is intended to surface what students already know about determining unknown values in proportional relationships. Students make use of the structure of proportional relationships to recover unknown values. This content first appears in Lesson 2: Dilation Mini Golf, where students use scale factors to calculate lengths.

Suggested Next Steps: If students struggle . . .

- Plan to review this problem before beginning Lesson 2.
- **Math Language Development** Consider asking students what they think *proportional relationship* means.

Problem 4
(Standards: **7.RP.A.2.D, MP2, MP7**)

This question is intended to surface students' understanding of graphs of proportional relationships. Students make use of the structure of the grid to reason abstractly and quantitatively about the meaning of a point on a line in the coordinate plane in context. This content first appears in Lesson 9: Water Slide, where students begin to calculate slope.

Suggested Next Steps: If students struggle . . .
- Plan to support this thinking in Lesson 9 as students investigate why two triangles sharing one side along the same line are similar.

Problem 5
(Standard: **6.NS.A.1**)

This question is intended to surface students' understanding of fraction division. This content first appears in Lesson 4: Dilations on a Plane, where students use fraction division to calculate unknown side lengths of similar triangles.

Suggested Next Steps: If students struggle . . .
- Consider monitoring students' work on Lesson 4, Activity 1, Problem 2, and making connections between dilating by a fractional scale factor and fraction division.

Problem 6
(Standards: **7.G.A.1, MP7**)

This question is intended to surface what students already know about scaled copies and scale factors from Math 7. Students use the structure of similarity to recover an unknown value. This content first appears in Lesson 2: Dilation Mini Golf, where students first use scale factors.

Suggested Next Steps: If students struggle . . .
- Plan to revisit this problem as part of the Warm-Up for Lesson 2 to review scaled copies and scale factors.
- **Math Language Development** While students have not formally been introduced to dilations yet, consider asking them what they think the word *scale factor* means.

Problem 7

(Standards: **7.G.A.1, MP7**)

This question is intended to surface students' understanding of scaled copies from Math 7. Students use the structure of the grid to determine if two figures are similar. This content first appears in Lesson 1: Sketchy Dilations.

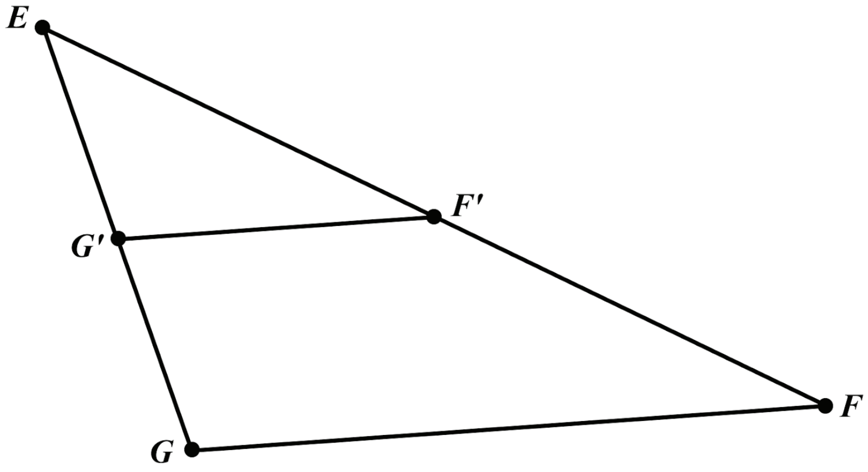
Suggested Next Steps: If students struggle . . .

- Plan to spend time on Lesson 1, Activity 1, Screen 7 using the "eyeball test" and emphasizing the relationship between equivalent ratios and scaled copies in the synthesis.

Unit 8.2, Quiz 1: Lessons 1–4 Name ______________________________

You will need a geometry toolkit for this quiz. Note: These figures are not drawn to scale.

1. Which statement could be used to describe the dilation that takes triangle GEF to triangle $G'EF'$?



A. Dilate triangle GEF using G as the center of dilation with a scale factor of 2.

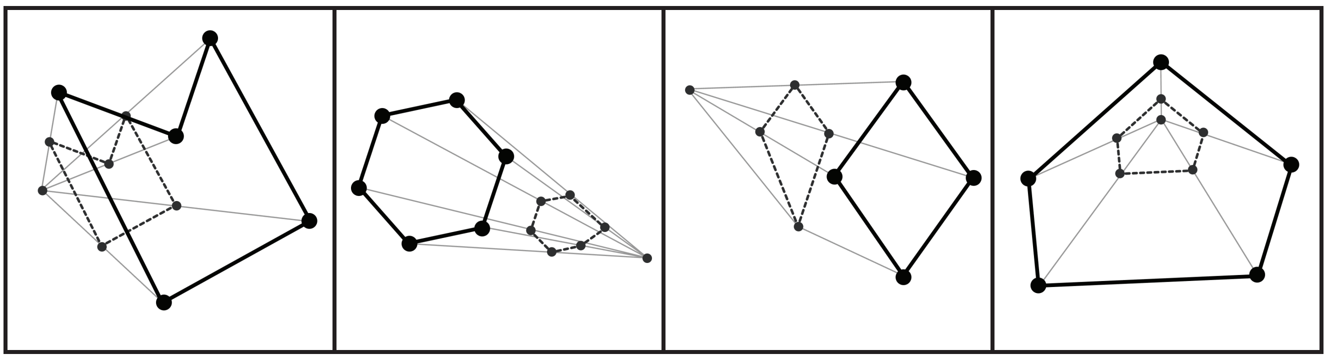
B. Dilate triangle GEF using G as the center of dilation with a scale factor of $\frac{1}{2}$.

C. Dilate triangle GEF using E as the center of dilation with a scale factor of 2.

D. Dilate triangle GEF using E as the center of dilation with a scale factor of $\frac{1}{2}$.

2. Circle **all** of the pairs of polygons in which the image appears to be the result of a dilation of the pre-image.

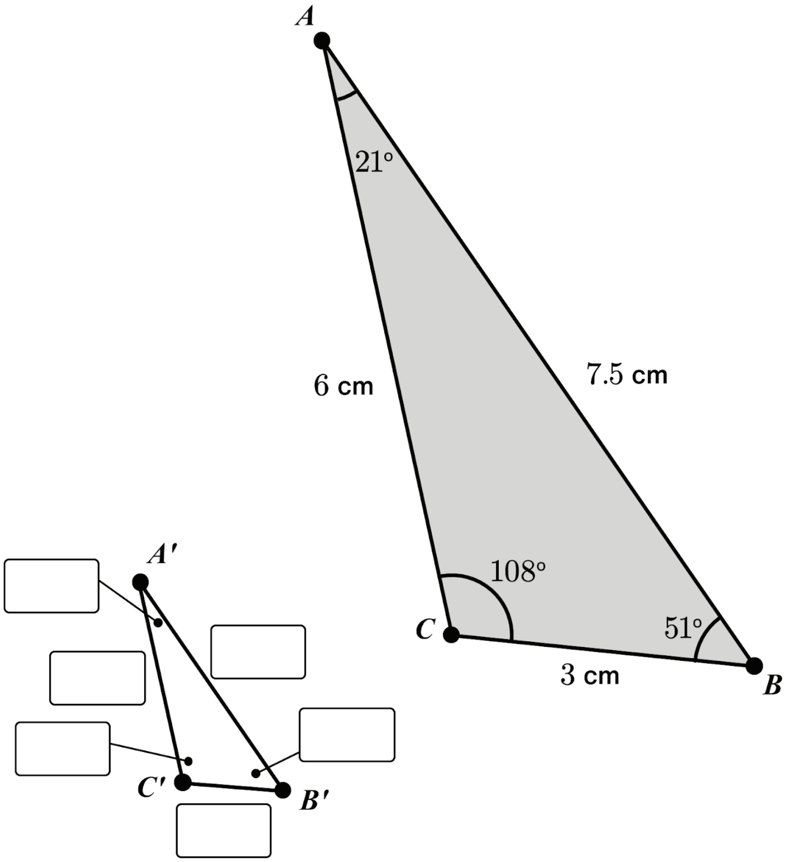
Pair 1 Pair 2 Pair 3 Pair 4



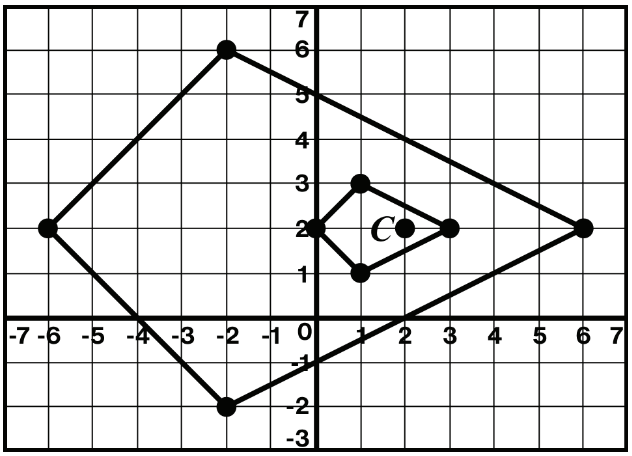
3. Triangle ABC is dilated using D as the center of dilation with a scale factor of $\frac{1}{3}$.

   3.1 Show the center of the dilation. Label it D.

   3.2 Label the side and angle measurements in triangle $A'B'C'$.



4. The smaller figure is dilated to create the larger figure. The center of dilation is labeled C.



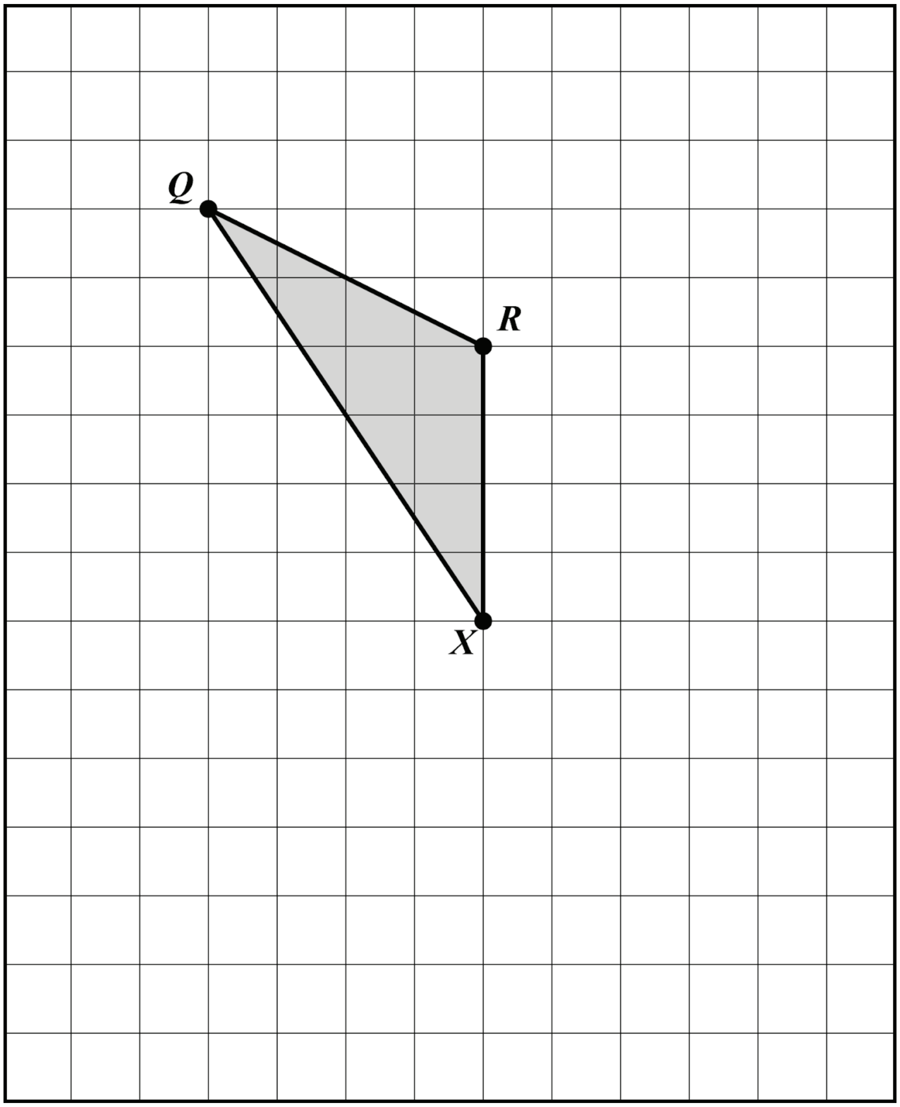
Describe this dilation. Be sure to include all of the information someone would need to perform the dilation.

 Name ______________________________

5. Here is triangle QRX.

   5.1 Draw the dilation of QRX using center Q and a scale factor of 2. Label the vertices of the dilation.

   5.2 Draw the dilation of QRX with center R and a scale factor of $\frac{1}{4}$. Label the vertices of the dilation.



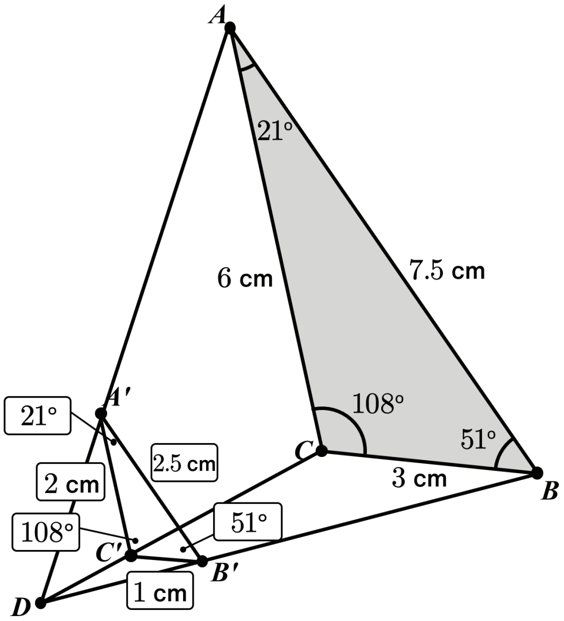
Unit 8.2, Quiz 1: Lessons 1–4

Answer Key

1. D

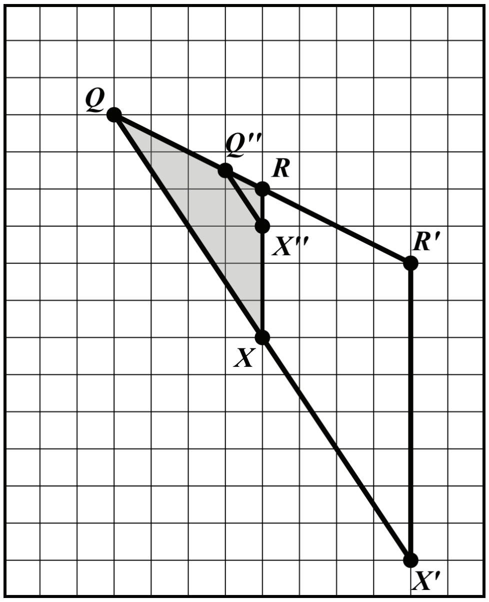
2. Pair 1 and Pair 4

3.



4. *Responses vary.* The smaller figure is dilated using $C = (2,\ 2)$ as the center of dilation with a scale factor of 4.

5.



Unit 8.2, Quiz 1: Summary and Rubric

Content Standards Summary

Standard	8.G.A	8.G.A.4
Problems	2, 3	1, 4, 5

Problem 1
(Standard: **8.G.A.4**)

In this problem, students describe a dilation with a scale factor less than 1. This problem corresponds most directly to the work students did in Lesson 3: Match My Dilation.

Suggested Next Steps: If students struggle . . .
- Consider having students draw the triangles side by side on a separate piece of paper. Have students label each triangle appropriately and identify both the direction of the dilation (from small to large, or large to small) and the scale factor.
- Consider revisiting Lesson 3, Activity 1.

Problem 2
(Standards: **8.G.A, MP7**)

In this problem, students recognize dilations as scaled copies. Students use the structure of the image and pre-image to determine if the dilation has been performed correctly. This problem corresponds most directly to the work students did in Lesson 1: Sketchy Dilations.

Suggested Next Steps: If students struggle . . .
- Consider asking students whether all angles in the image and pre-image are congruent.
- Consider revisiting Lesson 1, Activity 1.

Unit 8.2, Quiz 1: Summary and Rubric

Problem 3

(Standards: **8.G.A, MP7**)

In this problem, students identify the center used in a dilation and calculate side lengths of an image after a dilation. Students use the structure of dilation to recover the missing center of dilation, unknown lengths, and unknown angles. This problem corresponds most directly to the work students did in Lesson 2: Dilation Mini Golf.

Suggested Next Steps: If students struggle . . .

- Consider asking students to draw lines from the vertices in the pre-image to the corresponding vertices in the image, then have them extend the lines until they intersect. Consider reviewing the definition of *scale factor*.
- Consider revisiting Lesson 2, Activity 2.

Problem 4

(Standards: **8.G.A.4, MP6, MP7**)

In this problem, students precisely describe a dilation on a coordinate plane, including its center and scale factor. Students use the structure of the grid to describe the dilation with mathematically precise language. This problem corresponds most directly to the work students did in Lesson 4: Dilations on a Plane.

Suggested Next Steps: If students struggle . . .

- Consider asking students what they would need to know if they were being asked to perform a dilation.
- Consider revisiting Lesson 4, Activity 1.

Unit 8.2, Quiz 1: Summary and Rubric

Problem 5

(Standards: **8.G.A.4, MP2**)

In this problem, students apply dilations to a figure on a grid. Students reason abstractly and quantitatively as they apply the definitions of *dilation* and *scale factor* to choose the correct coordinates for each image. This problem corresponds most directly to the work students did in Lesson 3: Match My Dilation.

Suggested Next Steps: If students struggle . . .

- Consider asking students to draw the slope triangle connecting the center of dilation with a point in the preimage (or line if points are on the same grid line), then have them use the scale factor to determine appropriate dimensions of the slope triangle (or line) connecting the center of dilation and the corresponding point of the image.
- Consider revisiting Lesson 3, Activity 1.

Unit 8.2, Quiz 1: Summary and Rubric

Problem	Standard	Meeting/Exceeding	Approaching	Developing	Beginning	
		4	3	2	1	0
1	8.G.A.4	Correct choice. • Center: E Scale factor: $\frac{1}{2}$			Incorrect choice. *Students who select "Center: E, Scale factor: 2" may have confused the image and pre-image.*	Did not attempt.
2	8.G.A, MP7	**All correct** choices and **no incorrect** choices. • Pair 1 • Pair 4	**One correct** choice and **no incorrect** choices. **Both correct** choices and **one incorrect** choice.	**One correct** choice and **one incorrect** choice.	**Only incorrect** choices. **Two or more incorrect** choices with some correct choices.	Did not attempt.
3.1	8.G.A, MP7	Work is complete and correct.	Work shows **conceptual understanding**, with minor errors. *E.g., Student estimates the center of the dilation in the generally correct location.*	Work shows a developing but **incomplete understanding**, with significant errors. *E.g., Student says C' or a point between the two triangles is the center of the dilation.*	Work shows **limited understanding**.	Did not attempt.

Unit 8.2, Quiz 1: Summary and Rubric

Problem	Standard	Meeting/Exceeding	Approaching	Developing	Beginning	
		4	**3**	**2**	**1**	**0**
3.2	8.G.A, MP7	Work is complete and correct. • $A'B'$: 2.5 cm • $B'C'$: 1 cm • $C'A'$: 2 cm	Work shows **conceptual understanding**, with minor errors. *E.g., Student correctly labels two sides.*	Work shows **incomplete understanding** with significant errors. *E.g., Student correctly labels one side.*	Work shows **limited understanding.**	Did not attempt.
3.3	8.G.A, MP7	Work is complete and correct. • $m\angle A'$: $21°$ • $m\angle B'$: $51°$ • $m\angle C'$: $108°$	Work shows **conceptual understanding**, with minor errors. *E.g., Student correctly labels two of the three angles.*	Work shows **incomplete understanding** with significant errors. *E.g., Student multiplies all of the angle measurements by* $\frac{1}{3}$.	Work shows **limited understanding.**	Did not attempt.
4	8.G.A.4, MP6, MP7	Student mentions center of dilation and scale factor with enough specificity to reproduce the dilation. *E.g., The smaller figure is dilated using C as the center of dilation with a scale factor of 4.*	Work shows **conceptual understanding**, with minor errors. *E.g., Student mentions the center of dilation or scale factor, but not both.*	Work shows **incomplete understanding** with significant errors. *E.g., The dilation is 2 because it doubles the size.*	Work shows **limited understanding.**	Did not attempt.

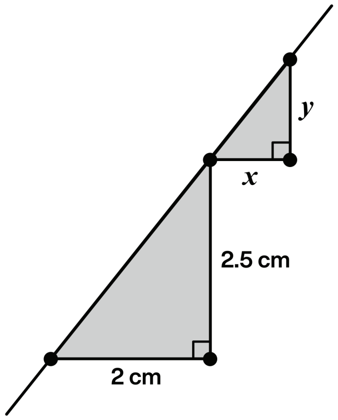
Unit 8.2, Quiz 1: Summary and Rubric

Problem	Standard	Meeting/Exceeding	Approaching	Developing	Beginning	
		4	3	2	1	0
5.1	8.G.A.4, MP2	Work is complete and correct.	Work shows **conceptual understanding**, with minor errors. *E.g.,* Dilated correctly with a scale factor of 2 but did not use Q as the center of the dilation. *E.g.,* Minor error dilating one of the points.	Work shows **incomplete understanding** with significant errors. *E.g.,* Used Q as the center of the dilation, but with an incorrectly applied scale factor. *E.g.,* Minor errors dilating two or three of the points.	Work shows **limited understanding.**	Did not attempt.
5.2	8.G.A.4, MP2	Work is complete and correct.	Work shows **conceptual understanding**, with minor errors. *E.g.,* Dilated correctly with a scale factor of $\frac{1}{4}$ but did not use R as the center of the dilation. *E.g.,* Minor error dilating one of the points.	Work shows **incomplete understanding** with significant errors. *E.g.,* Used R as the center of the dilation, but with an incorrectly applied scale factor. *E.g.,* Minor errors dilating two or three of the points.	Work shows **limited understanding** constructing dilations.	Did not attempt.

Unit 8.2, Quiz 2: Lessons 5–8 Name ______________________________

Note: These figures are not drawn to scale. All measurements are in grid units.

1. The two triangles shown are similar and their corresponding sides are parallel. Which is the value of $\frac{y}{x}$?



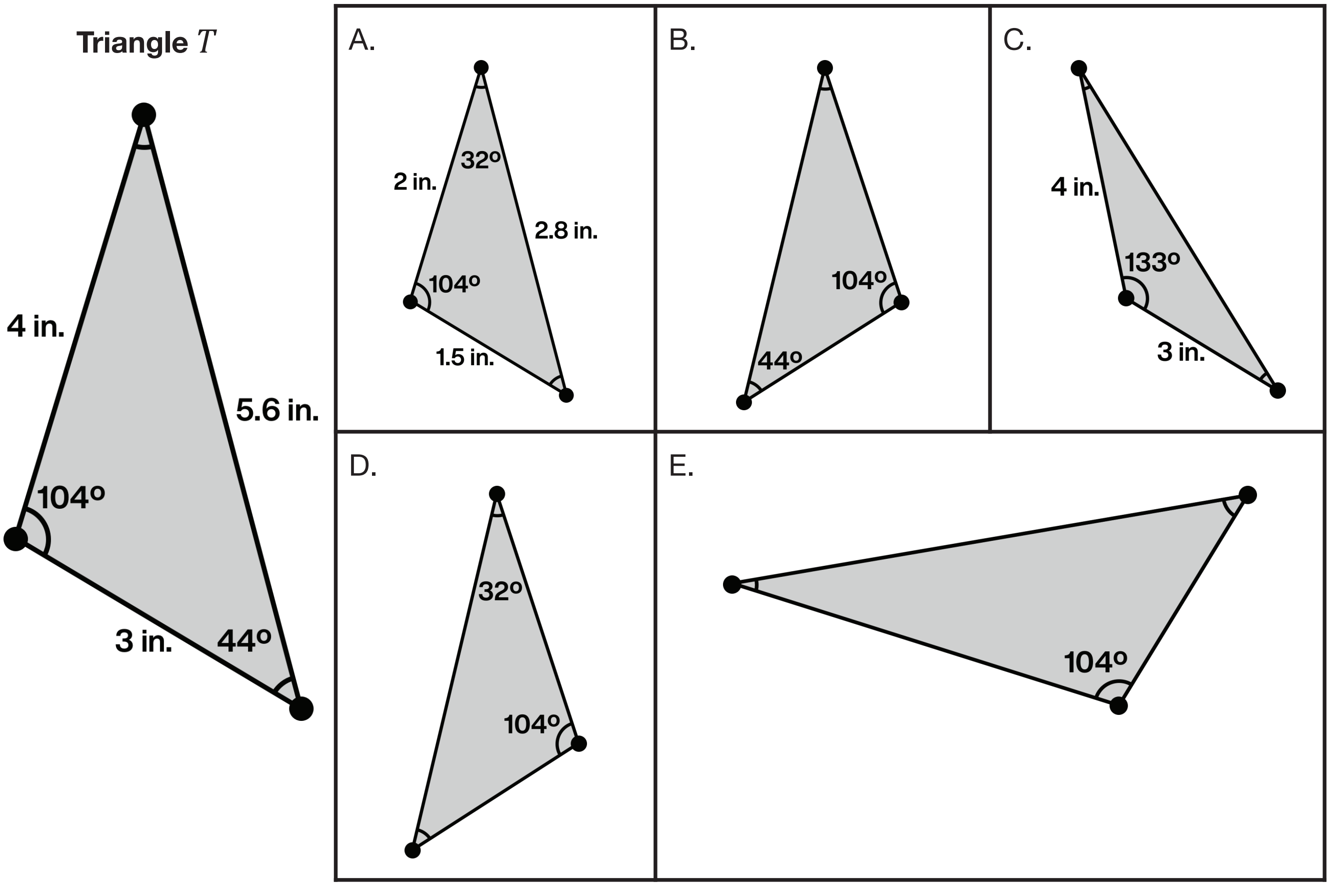
A. 0.5

B. 0.8

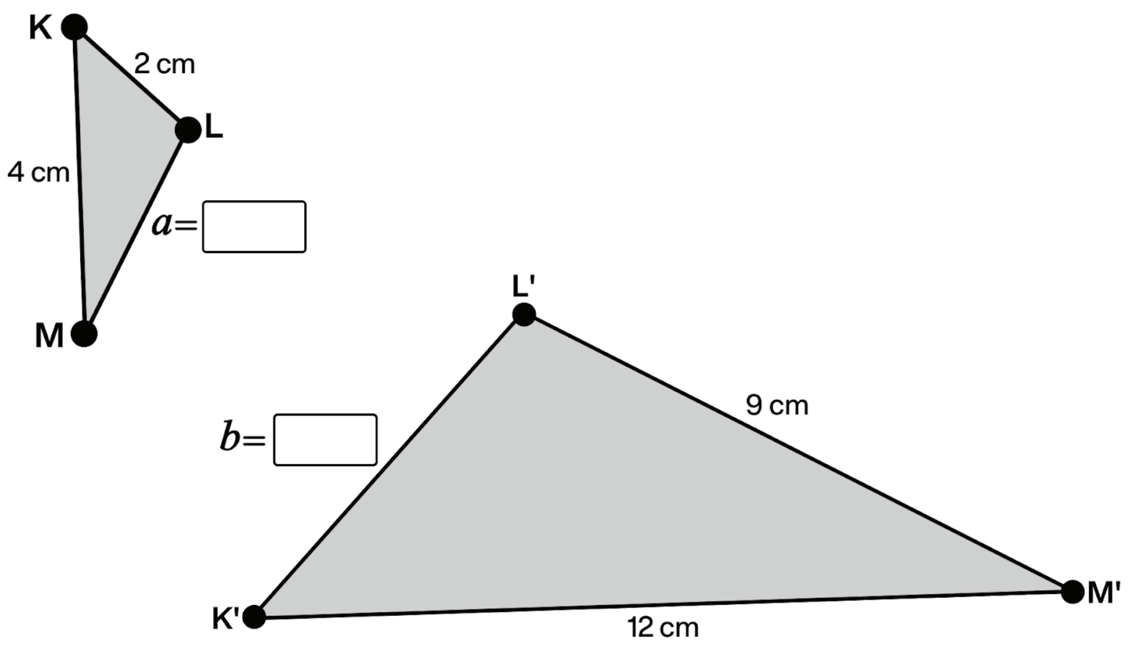
C. 1.25

D. 1.5

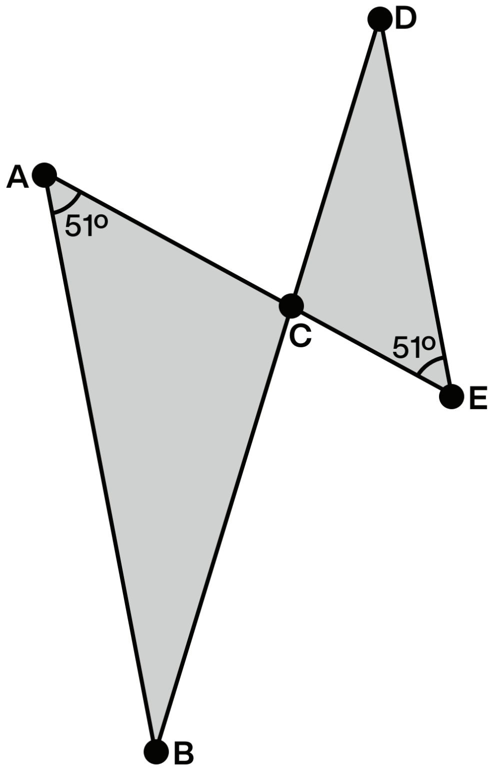
2. Circle **all** of the triangles that must be similar to triangle T.



3. These two triangles are similar. Find side lengths a and b.

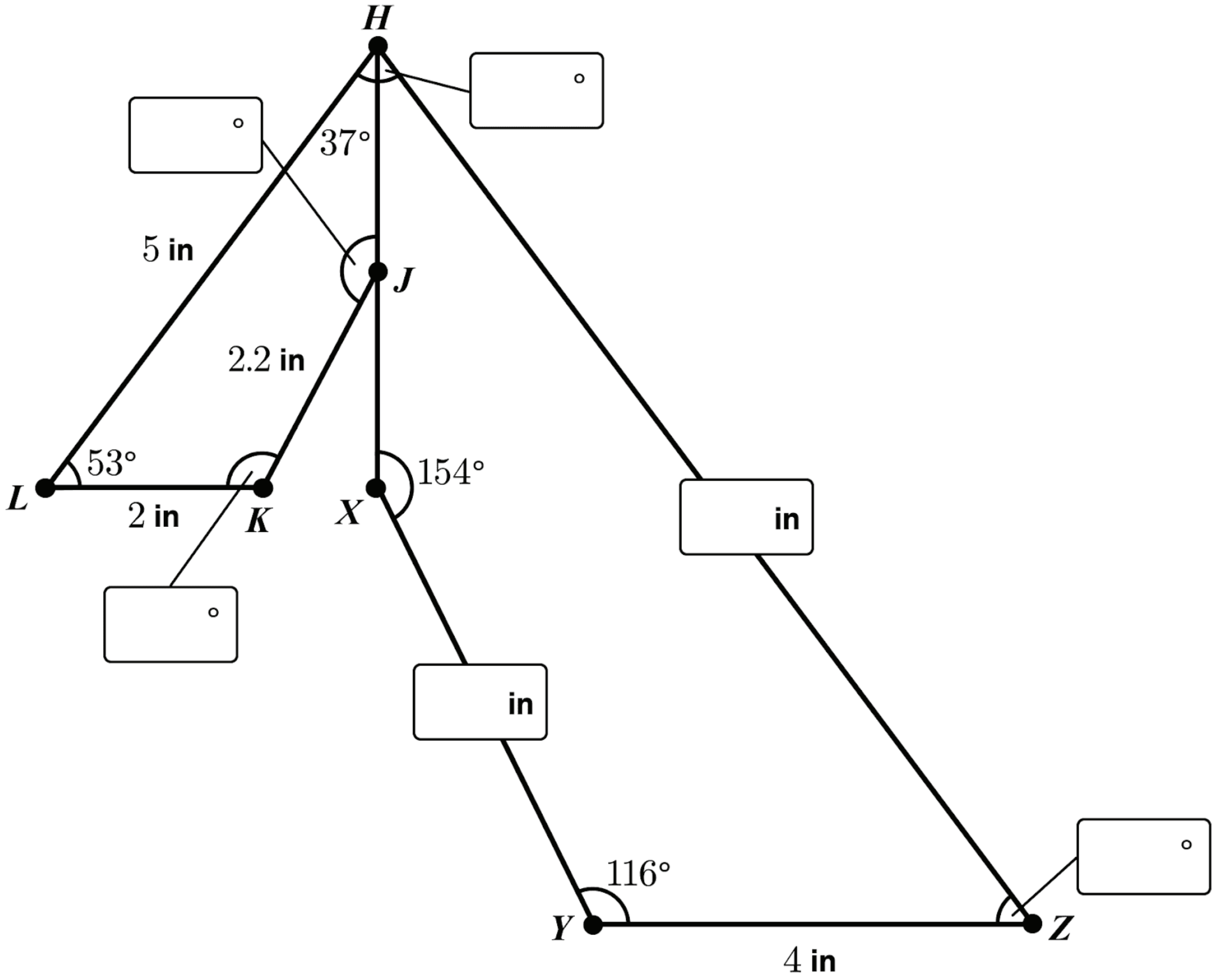


4. Are these triangles similar?



Explain how you know or what additional information you need to decide.

5. Figure $HJKL$ is similar to figure $HXYZ$.



5.1 Label the missing side and angle measurements in both figures.

5.2 Describe a sequence of transformations that shows that figure $HJKL$ is similar to figure $HXYZ$.

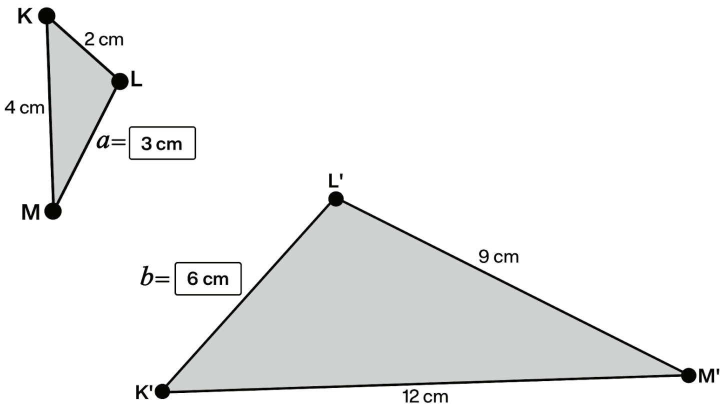
Unit 8.2, Quiz 2: Lessons 5–8

Answer Key

1. C

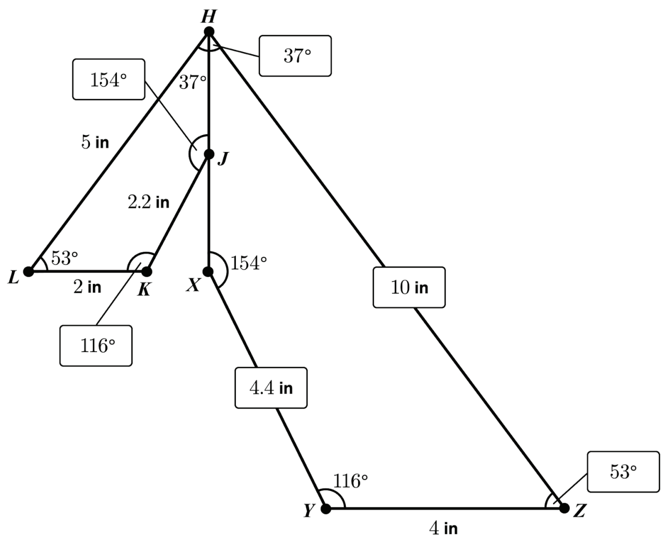
2. A, B, D

3.



4. *Responses vary.* Yes, the triangles are similar. Triangles need two congruent angles to be similar. Angles A and E are both $51°$, and angles ACB and ECD are congruent since they are vertical angles.

5.1



5.2 *Responses vary.* I would reflect $HJKL$ across line HJ, and then dilate it by a factor of 2 using H as the center of dilation.

Unit 8.2, Quiz 2: Summary and Rubric

Content Standards Summary

Standard	8.G.A	8.G.A.4	8.G.A.5
Problems	1, 3, 5.1	2, 5.2	2, 4

Problem 1

(Standards: **8.G.A, MP2**)

In this problem, students apply their knowledge of similar triangles to calculate a side length. They determine a ratio of unknown lengths using only the definition of similarity. This problem corresponds most directly to the work students did in Lesson 8: Shadows.

Suggested Next Steps: If students struggle . . .

- Consider asking students to form the corresponding ratio of known side lengths, then ask them how that ratio should be related to the ratio the problem asks them to solve.
- Consider revisiting Lesson 8, Activity 2.

Problem 2

(Standards: **8.G.A.4, 8.G.A.5, MP7**)

In this problem, students use side lengths and angle measures to determine whether or not triangles are similar. They use the structure of triangles to determine missing measurements and the relationship between similar figures. This problem corresponds most directly to the work students did in Lesson 7: Are Angles Enough?

Suggested Next Steps: If students struggle . . .

- Consider reviewing the criteria for triangles to be similar, as well as the fact that the total interior angle sum of a triangle must be $180°$.
- Consider revisiting Lesson 7, Activity 1.

Problem 3
(Standards: **8.G.A, MP6**)

In this problem, students determine missing side lengths in pairs of similar triangles using quotient relationships between side lengths. Students must attend to precision when comparing corresponding sides of each figure and by being careful to include proper units. This problem corresponds most directly to the work students did in Lesson 8: Shadows.

Suggested Next Steps: If students struggle . . .
- Consider asking students to identify corresponding sides between the figures, then use them to determine the scale factor.
- Consider revisiting Lesson 8, Activity 1.

Problem 4
(Standards: **8.G.A.5, MP7**)

In this problem, students use angle measurements to justify whether or not two triangles are similar. Students use the structure of vertical angles to reason about the missing angle measures, then use the structure of triangles to determine whether the triangles are similar. This problem corresponds most directly to the work students did in Lesson 7: Are Angles Enough?

Suggested Next Steps: If students struggle . . .
- Consider reviewing the definition of *vertical angles*, as well as the fact that the total interior angle sum of a triangle must be 180°.
- Consider revisiting Lesson 7, Activity 1.

Unit 8.2, Quiz 2: Summary and Rubric

Problem 5

(Standards: **8.G.A, 8.G.A.4, MP5**)

In this problem, students determine missing side lengths and angle measures in similar figures, and use a sequence of transformations to show that two figures are similar. Students must choose the correct transformation before defining their dilation to show the figures are similar. This problem corresponds most directly to the work students did in Lesson 5: Transformation Golf With Dilations and Lesson 7: Are Angles Enough.

Suggested Next Steps: If students struggle . . .

- Consider having students identify the scale factor first, then determine a transformation that allows the center of dilation to be easily identified.
- Consider revisiting Lesson 5, Activity 1 or Lesson 7, Activity 1.

Unit 8.2, Quiz 2: Summary and Rubric

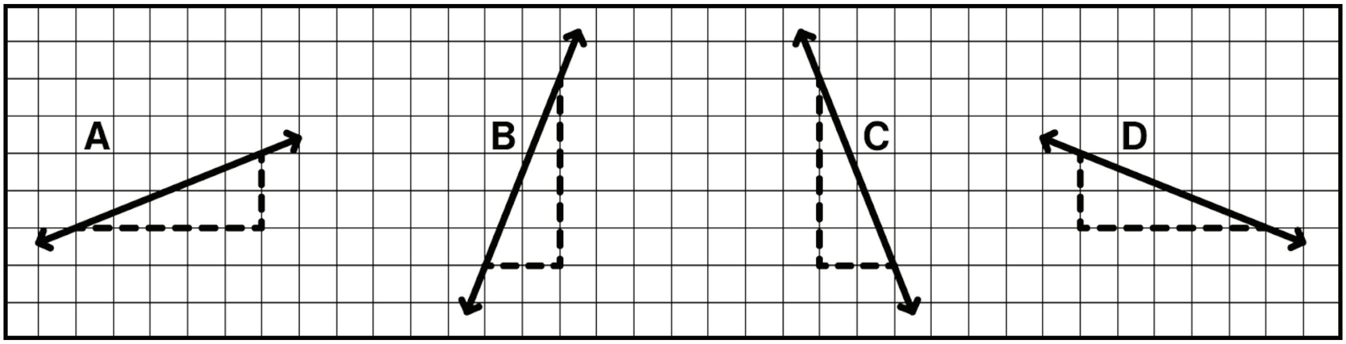
Problem	Standard	Meeting/Exceeding	Approaching	Developing	Beginning	
		4	3	2	1	0
1	8.G.A, MP2	Correct choice. • C. 1.25			Incorrect choice. *Students who select* 1.5 *may have maintained a constant difference between the sides of the triangle.*	Did not attempt.
2	8.G.A.4, 8.G.A.5, MP7	**All correct** choices and **no incorrect** choices.	**One or two correct** choices and **no incorrect** choices. **All correct** choices and **one incorrect** choice.	**One or two correct** choices but also includes **one incorrect** choice.	**Only incorrect** choices. **Both incorrect** choices with some correct choices.	Did not attempt.
3	8.G.A, MP6	Work is complete and correct. • LM: 3 cm • $L'K'$: 6 cm	Work shows **conceptual understanding**, with minor errors. *E.g., Student correctly determines one length and makes a minor calculator error on the other.*	Work shows a developing but **incomplete understanding**, with significant errors. *E.g., Students who write that* LM is 1 *cm may have maintained the difference between corresponding side lengths.*	Work shows **limited understanding** of using quotient relationships between side lengths.	Did not attempt.

Unit 8.2, Quiz 2: Summary and Rubric

Problem	Standard	Meeting/Exceeding	Approaching	Developing	Beginning	
		4	**3**	**2**	**1**	**0**
4	8.G.A.5, MP2, MP7	Correct answer with correct explanation. • A. Similar *E.g., Triangles need two congruent angles to be similar. Angles A and E are both $51°$, and angles ACB and ECD are congruent since they are vertical angles.*	Work shows **conceptual understanding** with some errors. *E.g., Not enough information. I need to know that at least two pairs of corresponding angles are congruent to decide if the triangles are similar.*	Work shows **incomplete understanding** with significant errors. *E.g., Similar. The triangles have the same shape and a $51°$ angle.*	Work shows **limited understanding** of using angle measurements to justify triangle similarity.	Did not attempt.
5.1	8.G.A	Work is complete and correct. • $m\angle J$: $154°$ • $m\angle K$: $116°$ • XY: 4.4 in. • HZ: 10 in. • $m\angle H$: $37°$ • $m\angle Z$: $53°$	Work shows **conceptual understanding**, with minor errors. *E.g., Student correctly labels 4 or 5 of the measurements.*	Work shows **incomplete understanding** with significant errors. *E.g., Student writes that the angles in figure $HXYZ$ are double the measure of the corresponding angles in figure $HJKL$.*	Work shows **limited understanding** of the side and angle relationships in similar figures.	Did not attempt.
5.2	8.G.A.4, MP5	Work is complete and correct. *E.g., Reflect $HJKL$ across line HJ, and then dilate it by a factor of 2 using H as the center of dilation.*	Work shows **conceptual understanding**, with minor errors. *E.g., Correct description but did not specify either the center of the dilation or the scale factor.*	Work shows **incomplete understanding** with significant errors. *E.g., Student describes a reflection or a dilation, but not both.*	Work shows **limited understanding** of sequences of transformations.	Did not attempt.

 Name ____________________

1. Which line has a slope of $\frac{5}{2}$?



2. Which statement is true?

   A. Dilations of a triangle keep angle measures the same.

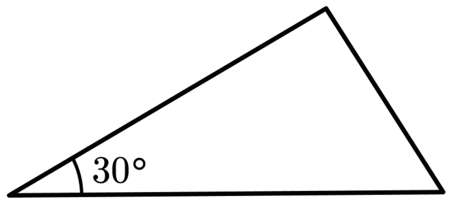
   B. Dilations of a triangle keep side lengths the same.

   C. Dilations of a triangle must be congruent to the original triangle.

   D. Dilations of a triangle always make the sides longer.

3. Here is Triangle 1. Triangle 2 also has a $30°$ angle.

   Explain or show why Triangle 1 and Triangle 2 might **not** be similar to each other.

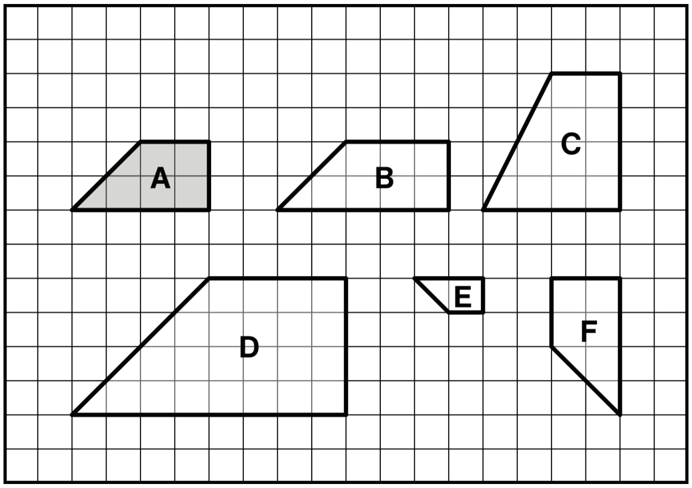


Triangle 1

 Name ____________________________

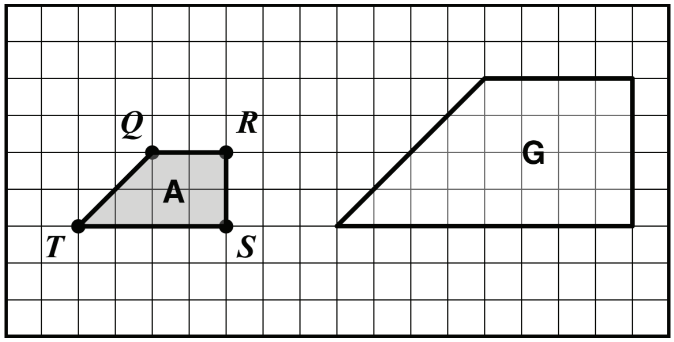
Here are some polygons.

4.1 Circle **all** of the polygons that are similar to polygon A.

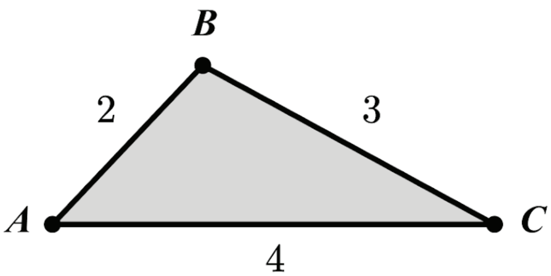


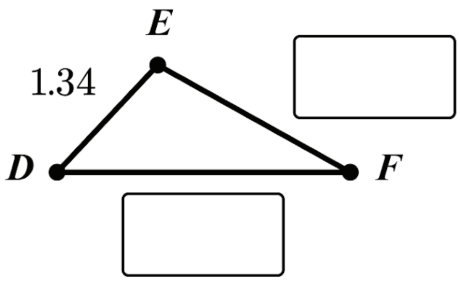
Polygon G is also similar to Polygon A.

4.2 Describe a sequence of transformations that takes Polygon A to Polygon G.

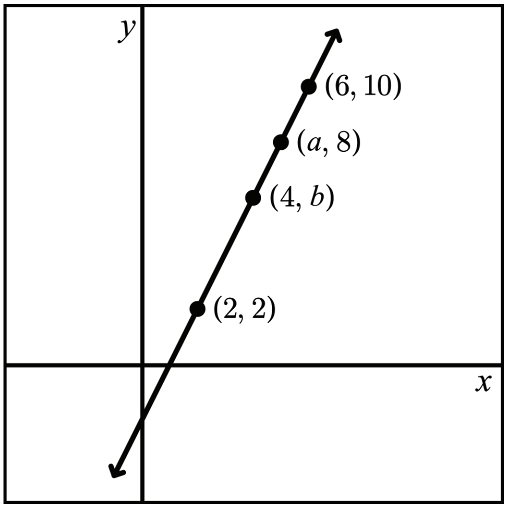


5. Triangles ABC and DEF are similar. Determine the exact lengths of segments DF and EF.





All of the points in the graph are on the same line.



6.1 Determine the slope of the line.

6.2 Determine values for a and b.

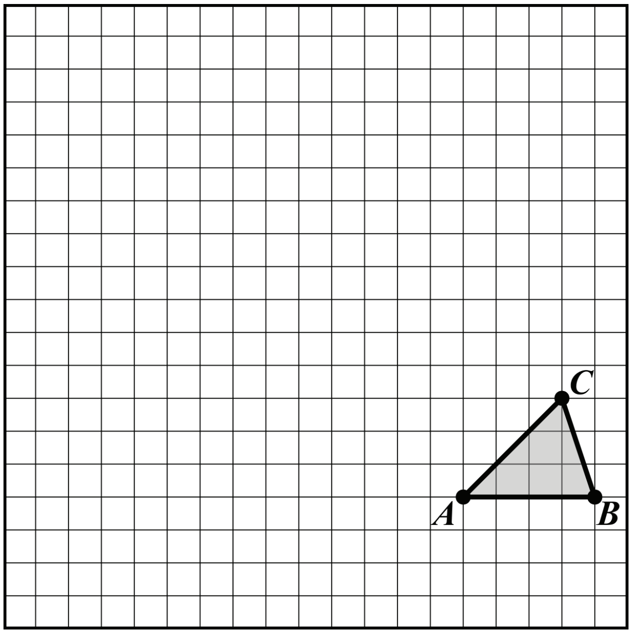
$a =$ $b =$

6.3 What is the y-coordinate when $x = 0$?

Explain or show your thinking.

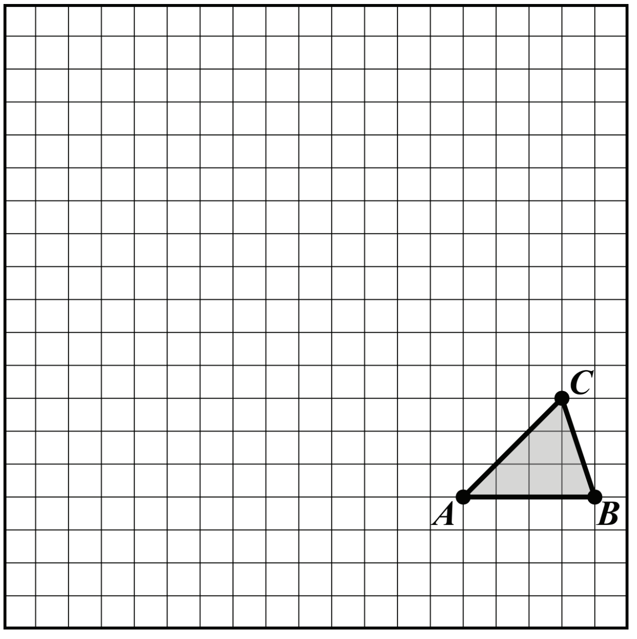
7.1 Triangle EFG is a dilation of triangle ABC with center B and a scale factor of 3.

Draw triangle EFG.



7.2 Triangle IJK is a dilation of triangle ABC with center A and a scale factor of $\frac{1}{2}$.

Draw triangle IJK.



7.3 Explain why EFG and IJK are similar.

Unit 8.2, End-Unit Assessment: Form A Name ________________________________

Reflection: Select a question to answer.

- ☐ What is something you are proud of from this unit?

- ☐ Write what you know about a topic from this unit that you weren't asked about today.

- ☐ Describe or show one strategy you found helpful in this unit.
  Name any students who helped you with this strategy.

- ☐ What else would you like your teacher to know?

1. B

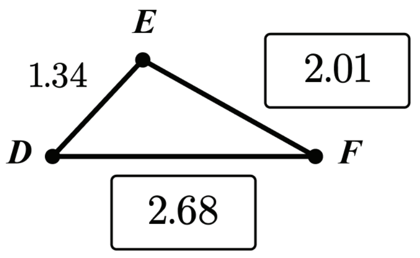
2. A. Dilations of a triangle keep angle measures the same.

3. *Responses vary.* For two triangles to be similar, all 3 pairs of corresponding angles must be congruent. One pair of corresponding angles is $30°$, but the remaining angles could be different in each triangle.

4.1 Polygons D, E, and F

4.2 *Responses vary.* Translate Polygon A 11 units right, then dilate Polygon A using a scale factor of 2 and center S.

5.



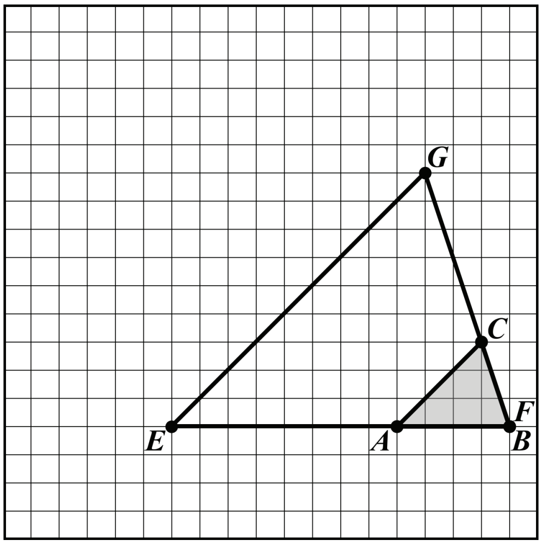
6.1 2 (or equivalent)

6.2 $a = 5$
$b = 6$

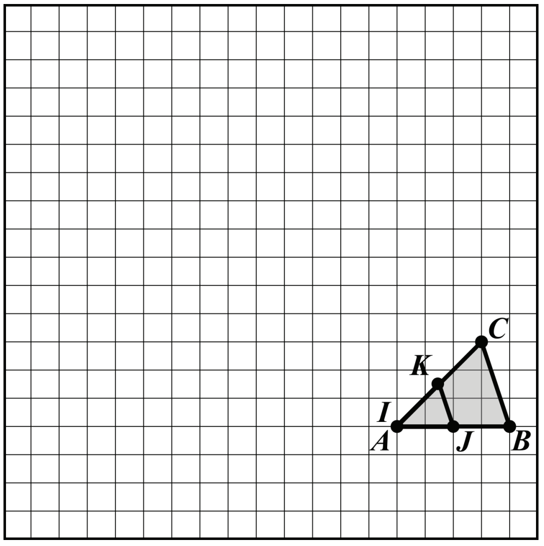
6.3 -2

Responses vary. This can be found by counting left 1 and down 2 twice from $(2,\ 2)$.

7.1



7.2



7.3 *Responses vary.* If EFG is dilated with center B and a scale factor of $\frac{1}{3}$, the result is ABC. If ABC is dilated with center A and a scale factor of $\frac{1}{2}$, the result is IJK.

Unit 8.2, End Assessment Summary and Rubric: Form A

Content Standards Summary

Standard	8.G.A.4	8.G.A.5	8.EE.B.6
Problems	2, 4, 5, 7	3	1, 6

Problem 1

(Standards: **8.EE.B.6, MP7**)

In this problem, students use the structure of the grid to determine the slope of a line in a plane. This problem corresponds most directly to the work students did in Lesson 9: Water Slide.

Suggested Next Steps: If students struggle . . .

- Consider reviewing the definition of *slope*.
- Consider revisiting Lesson 9, Activity 1.

Problem 2

(Standard: **8.G.A.4**)

In this problem, students recognize the properties of dilations. This problem corresponds most directly to the work students did in Lesson 6: Social Scavenger Hunt.

Suggested Next Steps: If students struggle . . .

- Consider helping students craft an example using the sketch tool so they can check each property for themselves.
- Consider revisiting Lesson 6.

Problem 3

(Standard: **8.G.A.5, MP3**)

In this problem, students recognize the information necessary to establish similarity of triangles. Students construct an argument for why the given triangles must be similar. This problem corresponds most directly to the work students did in Lesson 7: Are Angles Enough?

Suggested Next Steps: If students struggle . . .

- Consider reviewing the total interior angle sum of a triangle, and ask students if they can draw multiple triangles with at least one $30°$ angle.
- Consider revisiting Lesson 7, Activity 1.

Problem 4

(Standards: **8.G.A.4, MP1, MP7**)

In this problem, students use transformations on a grid to describe why two polygons are similar. Students use the structure of the grid to define their transformations, and could possibly determine multiple transformations that lead to the same outcome. This problem corresponds most directly to the work students did in Lesson 3: Match My Dilation and Lesson 6: Social Scavenger Hunt.

Suggested Next Steps: If students struggle . . .

- Consider showing students an appropriate transformation, then ask them to determine their own unique transformation.
- Consider revisiting Lesson 3, Activity 1.

Unit 8.2, End Assessment Summary and Rubric: Form A

Problem 5

(Standard: **8.G.A.4**)

In this problem, students determine missing side lengths in pairs of similar triangles using quotient relationships between side lengths. This problem corresponds most directly to the work students did in Lesson 8: Shadows.

Suggested Next Steps: If students struggle . . .

- Consider asking students to first determine the scale factor between the figures, then ask how that scale factor can be used to determine the missing lengths.
- Consider revisiting Lesson 8, Activity 2.

Problem 6

(Standards: **8.EE.B.6, MP7**)

In this problem, students use the structure of the grid to calculate slopes and use them to determine coordinates of points on a line. This problem corresponds most directly to the work students did in Lesson 10: Points on a Line.

Suggested Next Steps: If students struggle . . .

- Consider reviewing the definition of *slope* and helping students organize the given information into a table. Then ask students whether the points they choose from the line to calculate its slope should change their answer.
- Consider revisiting Lesson 10, Activity 1.

Problem 7

(Standards: **8.G.A.4, MP6, MP7**)

In this problem, students use the structure of a grid to apply dilations to a polygon. Students use the structure of the grid to precisely dilate a given figure with various scale factors. This problem corresponds most directly to the work students did in Lesson 3: Match My Dilation.

Suggested Next Steps: If students struggle . . .

- Consider asking students to draw the slope triangle connecting the center of dilation with a point in the preimage (or line if points are on the same grid line), then have them use the scale factor to determine appropriate dimensions of the slope triangle (or line) connecting the center of dilation and the corresponding point of the image.
- Consider revisiting Lesson 3, Activity 1.

Unit 8.2, End Assessment Summary and Rubric: Form A

Problem	Standard	Meeting/Exceeding	Approaching	Developing	Beginning	
		4	3	2	1	0
1	8.EE.B.6, MP7	• Line B			Students who select Line A may have confused slope with the order for graphing coordinates and counted the change in x first. Students who select Line C may have counted the slope without attending to the direction. Students who select Line D may have made both errors.	
2	8.G.A.4	• Dilations of a triangle keep angle measures the same.			Students who select “Dilations of a triangle must be congruent to the original triangle” may have confused the word *congruent* with *similar*. Students who select “Dilations of a triangle keep side lengths the same” may have confused sides and angles.	Did not attempt.

Unit 8.2, End Assessment Summary and Rubric: Form A

Problem	Standard	Meeting/Exceeding	Approaching	Developing	Beginning	
		4	**3**	**2**	**1**	**0**
3	8.G.A.5 MP3	Work is complete and correct. • For two triangles to be similar, all three pairs of corresponding angles must be congruent. One pair of corresponding angles is $30°$, but the remaining angles could be different in each triangle.	Work shows conceptual understanding and mastery, with some errors. Student makes a minor error in discussing possible angle measurements.	Work shows a developing but incomplete conceptual understanding, with significant errors. Student states that one pair of congruent corresponding angles is sufficient for similarity.	Weak evidence of understanding of triangle similarity. Student does not mention any angle relationships.	Did not attempt.
4.1	8.G.A.4	Student selects all of the correct choices and does not select any incorrect choices. • D • E • F	Student selects one or two of the correct choices and does not select any incorrect choices. Students who do not say Polygon F is similar may not recognize that congruent polygons are similar.	Student selects one or two of the correct choices but also includes an incorrect choice. Student selects all of the correct choices and one incorrect choice.	Student selects only incorrect choices. Student selects two or more incorrect choices with some correct choices.	

Unit 8.2, End Assessment Summary and Rubric: Form A

Problem	Standard	Meeting/Exceeding	Approaching	Developing	Beginning	
		4	**3**	**2**	**1**	**0**
4.2	8.G.A.4, MP1, MP7	Work is complete and correct. Student mentions enough specific detail to reproduce the transformation, and it is correct. ● Translate Polygon A 11 units right, then dilate Polygon A using a scale factor of 2 and center S.	Work shows conceptual understanding and mastery, with some errors. Student correctly describes a sequence of transformations but the description of transformations is imprecise. ● Dilate A, then translate it to G.	Work shows a developing but incomplete conceptual understanding, with significant errors. Student incorrectly describes a sequence of transformations. ● Dilate A with a scale factor of $\frac{1}{2}$.	Weak evidence of understanding transformations. Student does not mention any transformations. ● G is the same as A, just a little bit bigger.	Did not attempt.
5	8.G.A.4	Work is complete and correct. ● Segment DF: 2.68 units (twice as long as segment DE) ● Segment EF: 2.01 units ($\frac{3}{2}$ times as long as segment DE)	Student correctly determines one of the two lengths. ● Students who say the length of segment DF is 2 may have made a rounding error when finding the length of segment DF.	Student makes errors calculating the length of each segment, but shows evidence of proportional reasoning.	Student shows weak understanding of calculating length of similar figures. Students who say the length of segment EF is 2.34 and the length of segment DF is 3.34 may think that they add the same number to corresponding sides instead of multiplying.	Did not attempt.

Unit 8.2, End Assessment Summary and Rubric: Form A

Problem	Standard	Meeting/Exceeding	Approaching	Developing	Beginning	
		4	3	2	1	0
6.1	8.EE.B.6, MP7	Work is complete and correct. • 2 (or equivalent)	Work shows general conceptual understanding and mastery, with some errors. Student may have confused calculating slope with the process for graphing a coordinate, and considered the horizontal value first. • $\frac{1}{2}$ (or equivalent)	Work shows a developing but incomplete conceptual understanding, with significant errors. Student may have applied the process for finding the slope of a proportional relationship instead of finding the slope of a linear relationship by selecting a single point and dividing the x and y-values. • $\frac{5}{3}, \frac{3}{5}, 1$ (or equivalent)	Weak evidence of understanding how to calculate the slope of a line.	Did not attempt.
6.2	8.EE.B.6, MP7	Work is complete and correct. • $a = 5, b = 6$.	Work shows conceptual understanding and mastery, with minor errors in calculation.	Work shows a developing but incomplete conceptual understanding, with significant errors.	Weak evidence of understanding.	Did not attempt.

Unit 8.2, End Assessment Summary and Rubric: Form A

Problem	Standard	Meeting/Exceeding	Approaching	Developing	Beginning	
		4	**3**	**2**	**1**	**0**
6.3	8.EE.B.6, MP7	Student successfully answers the question and includes a logical and complete explanation. • -2. I counted left 1 and down 2 twice from the point $(2, 2)$.	Correct answer with minor flaws in explanation. Incorrect answer with logical and complete explanation. Incorrect or imprecise use of slope.	Correct answer with incomplete explanation. Incorrect answer with explanation that communicates partial understanding of slope. Visual estimation only.	Incorrect answer with or without incorrect explanation.	Did not attempt.
7.1	8.G.A.4, MP6, MP7	Work is complete and correct.	Work shows general conceptual understanding and mastery, with some errors. • Dilated correctly with a scale factor of 3 but did not use B as the center of the dilation. • Minor error dilating one of the points.	Work shows a developing but incomplete conceptual understanding, with significant errors. • Used B as the center of the dilation, but with an incorrectly applied scale factor. • Minor errors dilating two or three of the points.	Weak evidence of how to construct a dilation.	Did not attempt.

Unit 8.2, End Assessment Summary and Rubric: Form A

Problem	Standard	Meeting/Exceeding	Approaching	Developing	Beginning	
		4	3	2	1	0
7.2	8.G.A.4, MP6, MP7	Work is complete and correct.	Work shows general conceptual understanding and mastery, with some errors. • Dilated correctly with scale factor of $\frac{1}{2}$ but did not use A as the center of dilation. • Minor error dilating one of the points.	Work shows a developing but incomplete conceptual understanding, with significant errors. • Used A as the center of dilation, but with an incorrectly applied scale factor. • Minor error dilating two or three of the points.	Weak evidence of how to construct a dilation.	Did not attempt.
7.3	8.G.A.4, MP6	Explanation is complete and correct. • If EFG is dilated with center B and a scale factor of $\frac{1}{3}$, the result is ABC. If ABC is dilated with center A and a scale factor of $\frac{1}{2}$, the result is IJK.	Explanation shows general conceptual understanding and mastery, with some errors. • States that EFG and IJK are dilations of each other, but without a justification such as referencing ABC.	Explanation shows a developing but incomplete conceptual understanding, with significant errors. • Response mentions dilations but is not clear.	Weak evidence of understanding how dilations relate to similarity.	Did not attempt.

Problem 1

Circle **all** of the tables that could represent proportional relationships.

A

x	y
2	3
5	7.5
10	15

B

x	y
0	0
3	7
6	14

C

x	y
0	2
2	4
4	6

Problem 2

To mix a particular shade of purple paint, red paint and blue paint are mixed in the ratio $5 : 3$.

Find the number of gallons of red paint and of blue paint needed to make 20 gallons of this shade of purple paint.

Red Paint	**Blue Paint**

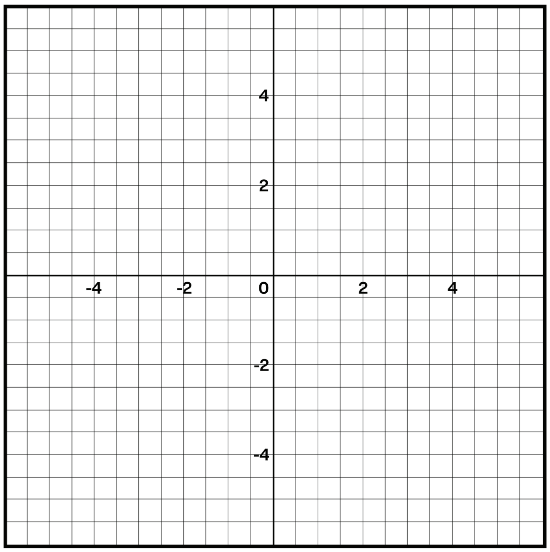
Problem 3

At one gas station, gas costs $\$2.75$ per gallon. Write an equation that relates the total cost, C, to the number of gallons of gas purchased, g.

Problem 4

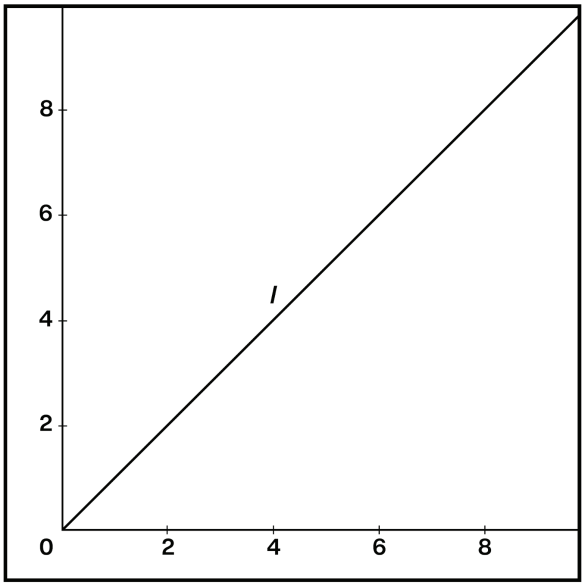
4.1 Plot and label three different points with an x-coordinate of 3.

4.2 Describe **all** of the points with an x-coordinate of 3.



 Name ________________________________

Problem 5



On the coordinate plane, draw:

- A line m that is a translation of line l.
- A line n that is a rotation of line l using the origin as the center of rotation.

Label these lines m and n.

Problem 6

A store sells ice cream with assorted toppings. They charge $\$3.00$ for an ice cream plus 50 cents per ounce of toppings.

6.1 How much does an ice cream cost with 4 ounces of toppings?

6.2 How much does an ice cream cost with 11 ounces of toppings?

6.3 If Alejandro’s ice cream costs $\$3.50$ more than Dakota’s ice cream, how much more did Alejandro’s toppings weigh?

Answer Key

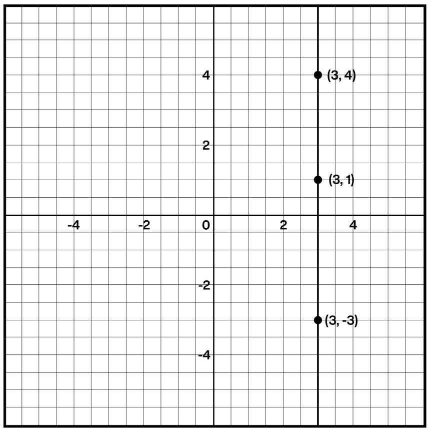
1. A and B

2.

Red Paint	Blue Paint
12.5 gallons	7.5 gallons

3. $C = 2.75g$ (or equivalent)

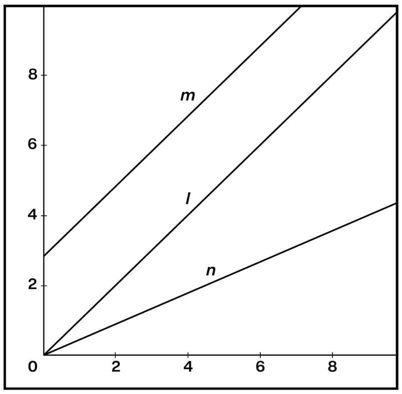
4.1 *Responses vary.*



4.2 *Responses vary.*

- The line $x = 3$ is drawn.
- The equation $x = 3$ is written.
- The written response includes "a vertical line" as a description for the points.

5.



6.1 $\$5$

6.2 $\$8.50$

6.3 7 ounces

Unit 8.3, Readiness Check Summary

For teachers who choose to spread out the questions, consider assigning the following:

- Problems 1, 2, and 3 before Lesson 1
- Problem 4 before Lesson 4
- Problems 5 and 6 before Lesson 5

Problem 1

(Standards: **7.RP.A.2.A, MP7**)

This question is intended to surface what students already know about proportional relationships. Students make use of structure as they look for patterns that indicate a proportional relationship. This content first appears in Lesson 3: Posters.

Suggested Next Steps: If students struggle . . .

- Plan to use this problem or a similar one as an additional Warm-Up activity. While students are working, listen for and record student language. Note any words or phrases that can be added to a visual display for students to use throughout the unit.
- During Lessons 1 and 2, plan to focus on multiple ways to know that a relationship is proportional (e.g., graph with a line through the origin, equivalent ratios in tables, etc.) and how to calculate equivalent ratios using coordinates of points on a graph.

Problem 2

(Standard: **7.RP.A.3**)

This question is intended to surface what students know about solving problems with proportional relationships before they encounter linear relationships. This content first appears in Lesson 2: Water Tank.

Suggested Next Steps: If students struggle . . .

- Consider using Unit 2, Lesson 1 of Math 7 to practice the concept of generating equivalent ratios before beginning Lesson 1.

Problem 3

(Standards: **7.RP.A.2.C, MP4**)

This question is intended to surface what students already know about writing equations to describe proportional relationships. Students model with mathematics as they represent the proportional relationship between total cost of gas and the number gallons of gas purchased with an equation.This content first appears in Lesson 1: Turtle Time Trials.

Suggested Next Steps: If students struggle . . .

- Plan to spend extra time on Lesson 1, Activity 1, Screen 7 selecting a variety of students' equations and inviting the class to predict the turtle's race results before revealing the animation.

Problem 4
(Standard: **8.EE.B**)

This question is intended to surface what students already know about the coordinate plane for their work with graphing lines. This content first appears in Lesson 4: Stacking Cups.

Suggested Next Steps: If students struggle . . .
- Plan to use Lesson 4, Activity 1, Screen 4 as an opportunity to strengthen student understanding of how a coordinate plane relates to the context. Consider asking students what each of the points on the graph represents.

Problem 5
(Standards: **8.G.A.1, 8.G.A.1.C**)

This question is intended to surface what students know from previous units about the effects of transformations on a line. Students will use this to make sense of equations of the form $y = mx + b$. This content first appears in Lesson 6: Translations.

Suggested Next Steps: If students struggle . . .
- Plan to use the Warm-Up in Lesson 6 to review translations. If students need additional practice recalling translations, refer to Unit 1, Lesson 3: Transformation Golf.

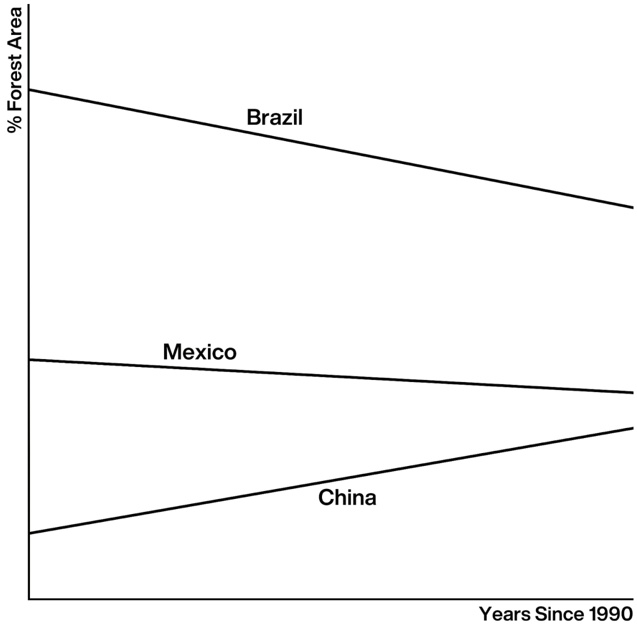
Problem 6
(Standards: **7.EE.B.3, MP2**)

This question is intended to surface what students already know about solving problems of the form $px + q = r$. Students must reason abstractly and quantitatively to make sense of the problem in context and formulate a solution. This content first appears in Lesson 5: Flags.

Suggested Next Steps: If students struggle . . .
- Plan to review it with them before beginning Lesson 5. Be sure to amplify terms like “constant of proportionality” and “unit rate” throughout this lesson.

Unit 8.3, Quiz: Lessons 1–9 Name ______________________________

1. The percentage of forest area is determined by dividing the forest area by the total land area of a region. The percentage of forest area in three countries was recorded over the past 25 years and is displayed in the graph.



Which statement is true?

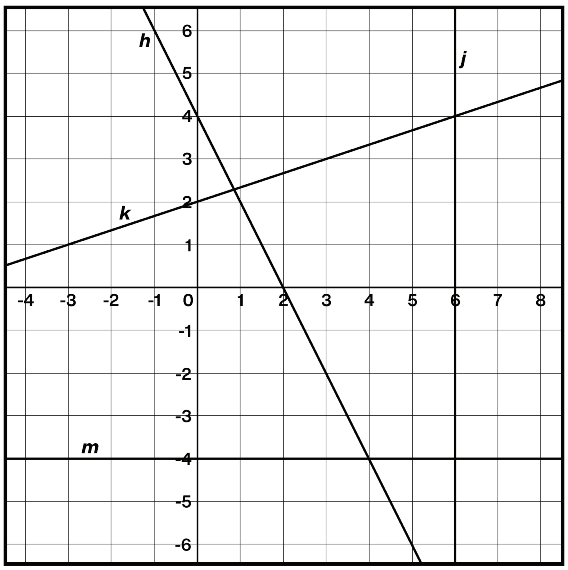
A. The percentage of forest area in Mexico increased as time passed.

B. The percentage of forest area in Brazil decreased at a constant rate.

C. Initially, the percentage of forest area was greater in Mexico than in Brazil.

D. The percentage of forest area in Mexico decreased faster than it did in Brazil.

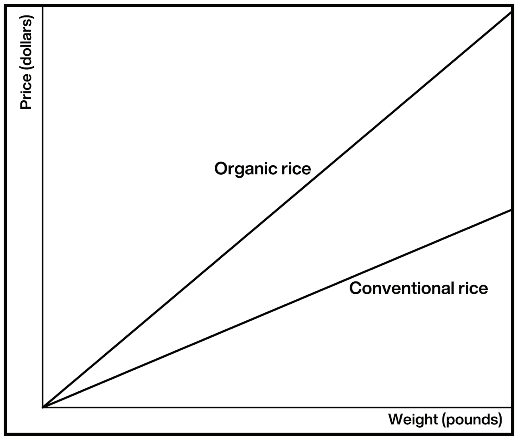
2. Write an equation for each line.



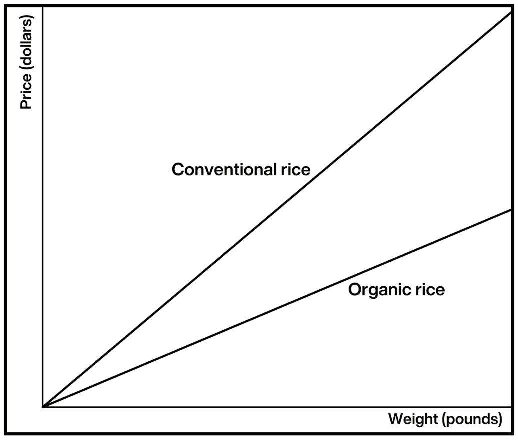
$h:$	
$j:$	
$k:$	
$m:$	

3. Organic rice costs twice as much per pound as conventional rice at a bulk food store. Circle **all** of the graphs that **could** represent the prices of rice at this store.

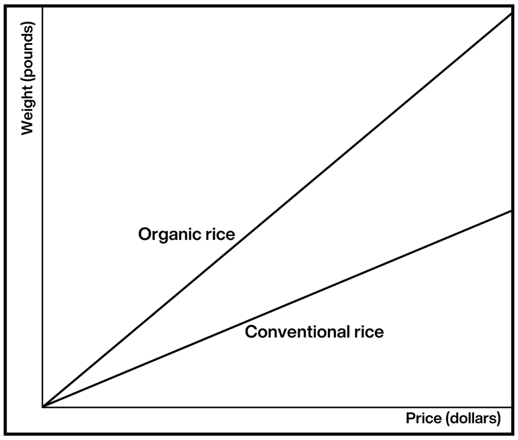
A.



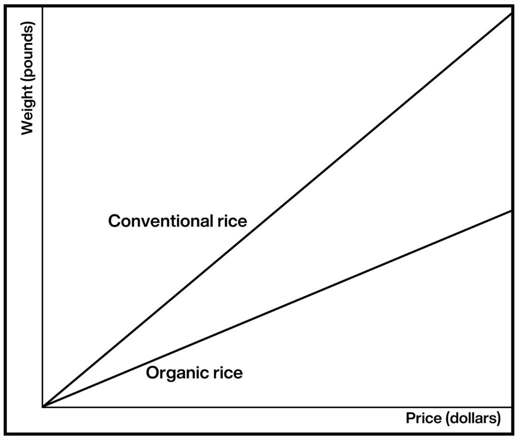
B.



C.



D.



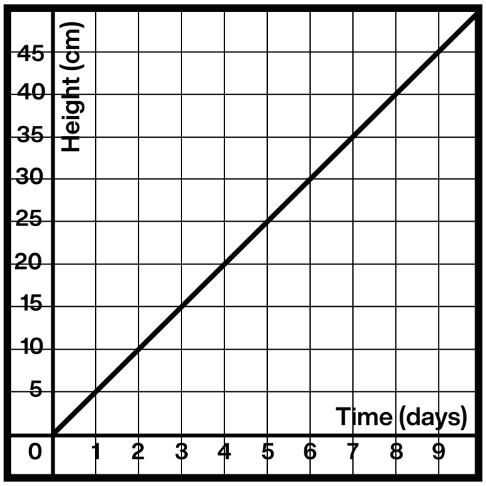
4. Nicolas planted three seeds. Each grew at a different constant rate. He measured the height of each plant every day and recorded his data below.

The graph, the equation, and the table show the relationship between time, t, in days and height, h, in centimeters for each of the plants.

Plant 1

Time (days)	Height (cm)
2	6
4	12
6	18
8	24
10	30

Plant 2



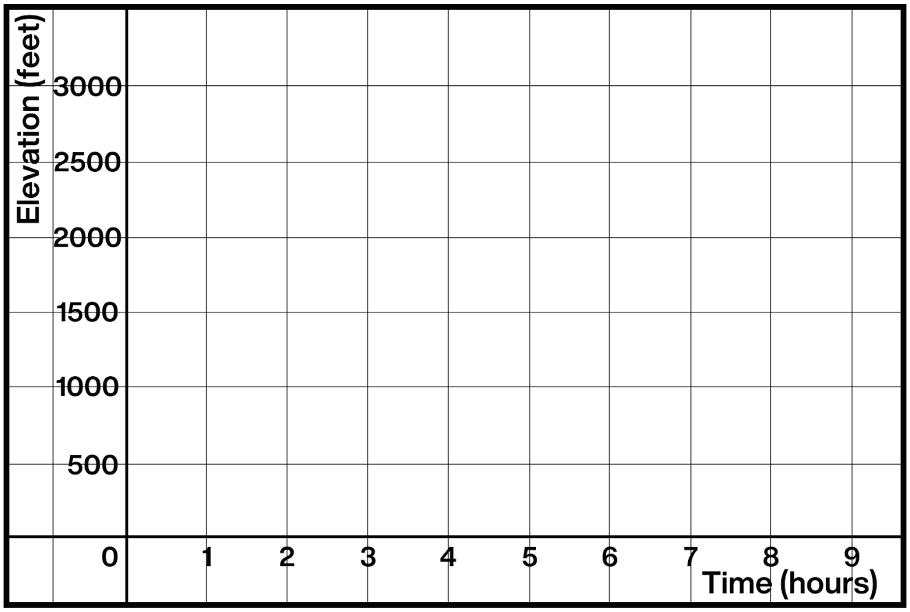
Plant 3

$$h = 1.5t$$

Which of the three plants grew the fastest? Explain how you know.

5. Marquis started at an elevation of $3\,000$ feet and hiked down a mountain at a constant rate. His elevation decreased 500 feet per hour.

5.1 Graph the relationship between Marquis' elevation and time as he hiked down the mountain.



5.2 Complete the table showing Marquis' elevation at different times during his hike.

Time (hr.)	Elevation (ft.)
0	
	2000
5	

5.3 Write an equation relating the number of hours hiked, t, and Marquis' elevation in feet, f.

Unit 8.3, Quiz: Lessons 1–9

Answer Key

1. B

2.

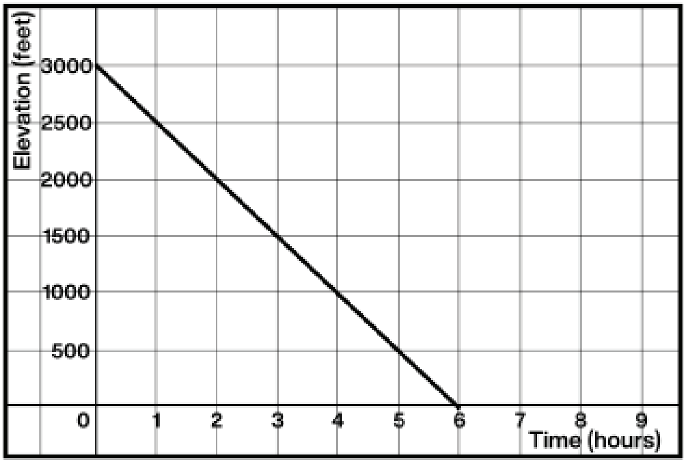
$h:\ y = -2x + 4$	$k:\ y = \frac{1}{3}x + 2$
$j:\ x = 6$	$m:\ y = -4$

3. A and D

4. Plant 2 grew the fastest.

Responses vary. The table shows that Plant 1 is 6 centimeters taller every two days, so Plant 1 grew 3 centimeters each day. The line in the graph has a slope of 5, so Plant 2 grew 5 centimeters per day. Plant 3's equation shows that for each day it grew 1.5 centimeters.

5.1



5.2

Time (hr.)	Elevation (ft.)
0	3000
2	2000
5	500

5.3 $f = 3000 - 500t$ (or equivalent)

Unit 8.3, Quiz: Summary and Rubric

Content Standards Summary

Standard	8.EE.B	8.EE.B.5	8.EE.B.6
Problems	1	3, 4	2, 5

Problem 1
(Standards: **8.EE.B, MP3**)

In this problem, students interpret lines with positive and negative slopes that represent real-world situations. Students must critique the given statements to determine if they are supported by the data shown. This problem corresponds most directly to the work students did in Lesson 7: Water Cooler.

Suggested Next Steps: If students struggle . . .
- **Math Language Development** Consider using the mathematical language routine Critique, Correct, Clarify to help students understand and communicate how words like *greater*, *faster*, and *increased* can be visualized on the graph.
- Consider revisiting Lesson 7, Activity 1.

Problem 2
(Standards: **8.EE.B.6, MP7**)

In this problem, students write equations of lines, including horizontal and vertical lines and lines with negative slope. Students make use of the structure of the coordinate plane to write equations in slope-intercept form. This problem corresponds most directly to the work students did in Lesson 9: Coin Capture.

Suggested Next Steps: If students struggle . . .
- Consider asking students to plot points on each line and have them use the coordinates to determine slopes and intercepts. For the vertical line, have students plot points and ask them what each coordinate pair has in common (the x-coordinate).
- Consider revisiting Lesson 9, Activity 1.

Unit 8.3, Quiz: Summary and Rubric

Problem 3

(Standards: **8.EE.B.5, MP6**)

In this problem, students interpret diagrams or graphs of proportional relationships in context. Students attend to precision when they decide on the appropriate relationship between the lines given the problem context and various axis labels. This problem corresponds most directly to the work students did in Lesson 1: Turtle Time Trials.

Suggested Next Steps: If students struggle . . .

- Consider drawing their attention to the way the axes are labeled. Have students plot points on each pair of lines that have the same x-coordinate, then have them interpret those points in context.
- Consider revisiting Lesson 1, Activity 1.

Problem 4

(Standards: **8.EE.B.5, MP1**)

In this problem, students compare proportional relationships given in different representations. Students must make sense of the different data representations to determine a measure of growth that can be compared between the three situations. This problem corresponds most directly to the work students did in Lesson 3: Posters.

Suggested Next Steps: If students struggle . . .

- Consider asking students to determine the *slope* in each representation, then ask them which units they should use to measure the slope.
- Consider revisiting Lesson 3, Warm-Up or Activity 1.

Unit 8.3, Quiz: Summary and Rubric

Problem 5

(Standard: **8.EE.B.6, MP1**)

In this problem, students create a graph with a negative slope and write an equation to represent a real-world situation. Students must make sense of the problem in context to represent the information given in a graph, a table, and an equation. This problem corresponds most directly to the work students did in Lesson 7: Water Cooler.

Suggested Next Steps: If students struggle . . .

- Consider having students write the given information as an ordered pair. Then have students write down Marquis' elevation after 1 hour, also as an ordered pair. Finally, ask how they can organize or use that information for each data representation.
- Consider revisiting Lesson 7, Activity 1.

Unit 8.3, Quiz: Summary and Rubric

Problem	Standard	Meeting/Exceeding	Approaching	Developing	Beginning	
		4	3	2	1	0
1	8.EE.B, MP3	Correct choice. • B. The percentage of forest area in Brazil decreased at a constant rate.			Incorrect choice. *Students who select "D. The percentage of forest area in Mexico decreased faster than it did in Brazil" may have noticed that the percentage of forest area is decreasing for both Mexico and Brazil.*	Did not attempt.
2	8.EE.B.6, MP7	Equations are complete and correct. • h: $y = -2x + 4$ • j: $x = 6$ • k: $y = \frac{1}{3}x + 2$ • m: $y = -4$	Work shows **conceptual understanding**, with minor errors. *E.g., Student correctly writes equations for three of the four lines.*	Work shows **incomplete understanding** with significant errors. *E.g., Student correctly writes equations for two of the four lines.*	Work shows **limited understanding.** *E.g., Student correctly writes equations for one of the four lines.*	Did not attempt.
3	8.EE.B.5, MP6	**Both correct** choices and **no incorrect** choices.	**One correct** choice and **no incorrect** choices. **Both correct** choices and **one incorrect** choice.	**One correct** choice and **one incorrect** choice.	**Only incorrect** choices. **Two incorrect** choices with some correct choices.	Did not attempt.

Unit 8.3, Quiz: Summary and Rubric

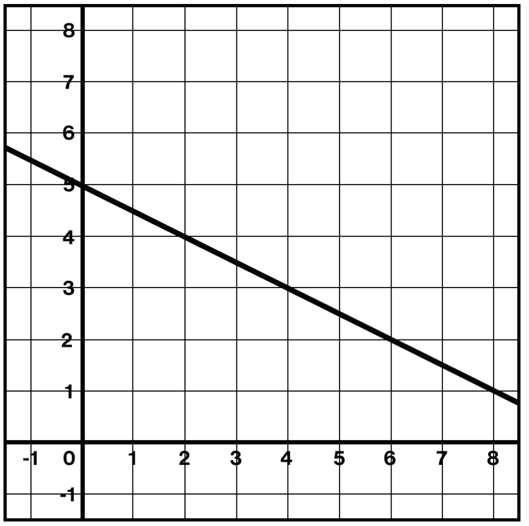
Problem	Standard	Meeting/Exceeding	Approaching	Developing	Beginning	
		4	**3**	**2**	**1**	**0**
4	8.EE.B.5, MP1	Correct answer with correct explanation. • Plant 2 *E.g., The table shows that Plant 1 is* 6 *cm taller every two days, so Plant 1 grew* 3 *cm each day. The line in the graph has a slope of* 5*, so Plant 2 grew* 5 *cm per day. Plant 3's equation shows that for each day it grew* 1.5 *cm.*	Work shows **conceptual understanding**, with minor errors. *E.g., Students who select Plant 1 may not have noticed the scale on the vertical axis of Plant 2's graph.*	Work shows **incomplete understanding** with significant errors. E.g., Students who explain that they selected Plant 2 because the graph goes up to 45 *cm may have noticed the values in the representations.*	Work shows **limited understanding.**	Did not attempt.
5.1	8.EE.B.6, MP1	Graph is complete and correct.	Work shows **conceptual understanding**, with minor errors. *E.g., Students whose lines have a* y*-intercept of* 3000 *or a slope of* -500 *but not both.*	Work shows **incomplete understanding** with significant errors.	Work shows **limited understanding.**	

Unit 8.3, Quiz: Summary and Rubric

Problem	Standard	Meeting/Exceeding	Approaching	Developing	Beginning	
		4	**3**	**2**	**1**	**0**
5.2	8.EE.B.6, MP1	Table is complete and correct. • 3000 feet • 2 hours • 500 feet	Work shows **conceptual understanding**, with minor errors. *E.g., Student correctly writes two of the three values.*	Work shows **incomplete understanding** with significant errors. *E.g., Student correctly writes one of the three values.*	Work shows **limited understanding.** *E.g., Student correctly writes zero of the three values.*	Did not attempt.
5.3	8.EE.B.6, MP1	Work is complete and correct. • $f = 3000 - 500t$ (or equivalent)	Work shows **conceptual understanding**, with minor errors. *E.g.,* Students who write $f = 3000t - 500$ may understand that the elevation started at 3000 and decreases by 500 each hour.	Work shows **incomplete understanding** with significant errors. *E.g.,* Students who write $f = 3000 - 500$ may understand that the elevation started at 3000 and decreases by 500 each hour.	Work shows **limited understanding** in constructing dilations.	Did not attempt.

1. This graph shows the line $2x + 4y = 20$. Select **all** of the points that are on the line.

   - ☐ $(0,\ 5)$
   - ☐ $(0,\ 10)$
   - ☐ $(1,\ 2)$
   - ☐ $(5,\ 0)$
   - ☐ $(10,\ 0)$



2. This graph shows the highest temperature each day for two weeks in Memphis and Phoenix.

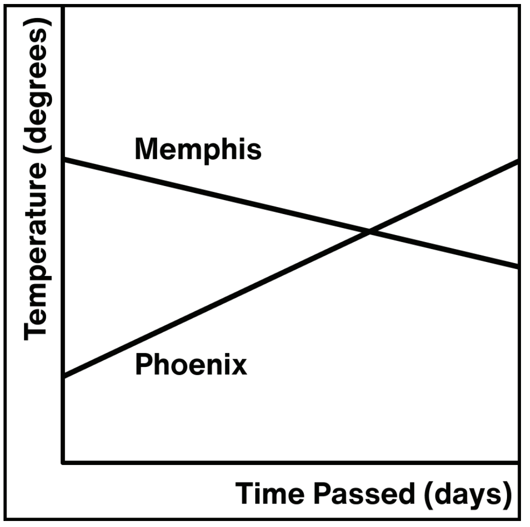
   Which statement is true?

   A. The highest temperature in Phoenix was never the same as the highest temperature in Memphis.

   B. The highest temperature in Memphis decreased steadily.

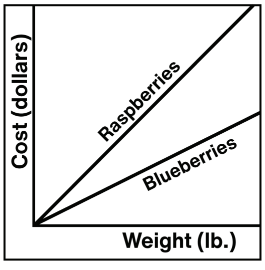
   C. Initially, the highest temperature was warmer in Phoenix than in Memphis.

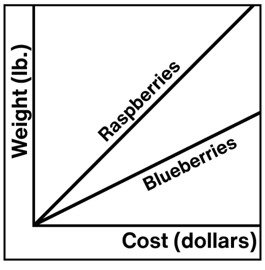
   D. The highest temperature in Memphis increased each day.

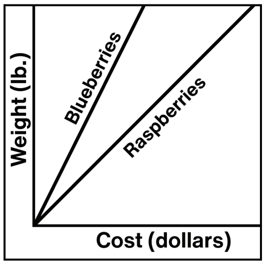


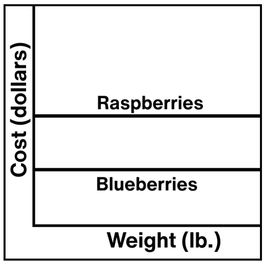
3. Raspberries cost twice as much as blueberries. The prices of blueberries and raspberries represent proportional relationships.

   Select **all** of the graphs that could represent the cost of raspberries and blueberries.

☐ 

☐ 

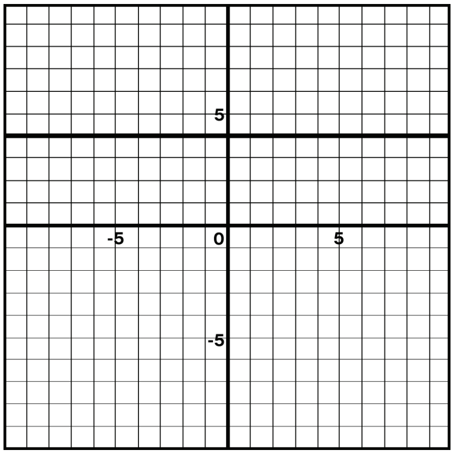
☐ 

☐ 

Unit 8.3, End-Unit Assessment: Form A Name ______________________________

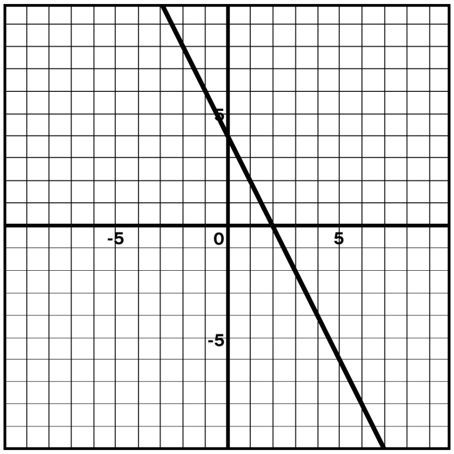
Write an equation for each line.

4.1



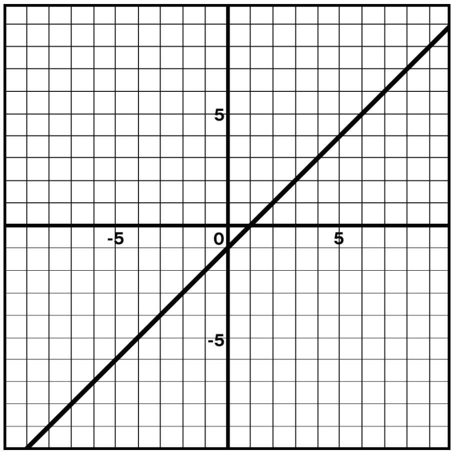
Equation:

4.2



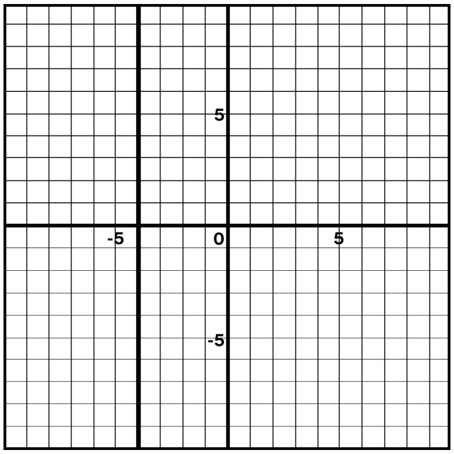
Equation:

4.3



Equation:

4.4



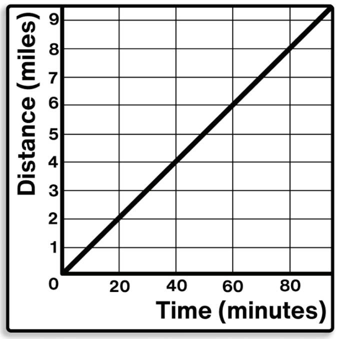
Equation:

5. One day, three runners ran 10 miles, each at their own constant speed.

   Which runner ran the fastest?

   Explain your thinking.

Runner 1



Runner 2

Time (minutes)	Distance (miles)
18	2
36	4
54	6
72	8
90	10

Runner 3

$$d = \frac{1}{8}t$$

t time (minutes)
d distance (miles)

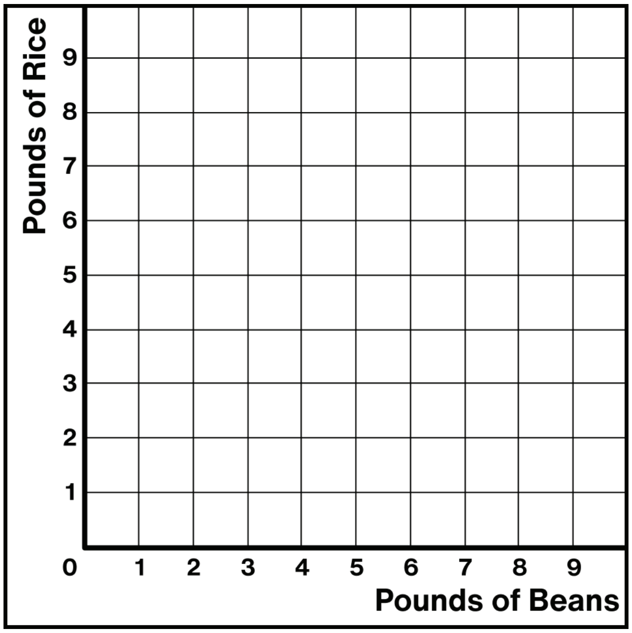
Beans cost $\$1.50$ per pound. Rice costs $\$1.00$ per pound. Joel has $\$7.50$ for beans and rice.

6.1 Complete the table showing three ways Joel can spend exactly $\$7.50$ on beans and rice.

Pounds of Beans, b	Pounds of Rice, r
1	
	3
5	

6.2 Write an equation of the pounds of beans, b, and rice, r, Joel can buy for $\$7.50$.

6.3 Draw a graph of the pounds of beans, b, and rice, r, Joel can buy for $\$7.50$.

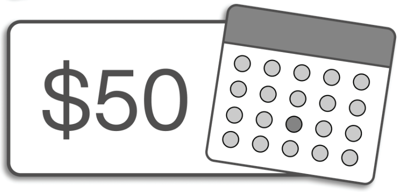


Unit 8.3, End-Unit Assessment: Form A Name ______________________________

A cell phone plan costs $\$200$ to start. Then, there is a $\$50$ charge each month.

7.1 What is the total cost (startup fee and monthly charge) to use the cell phone plan for 2 months?

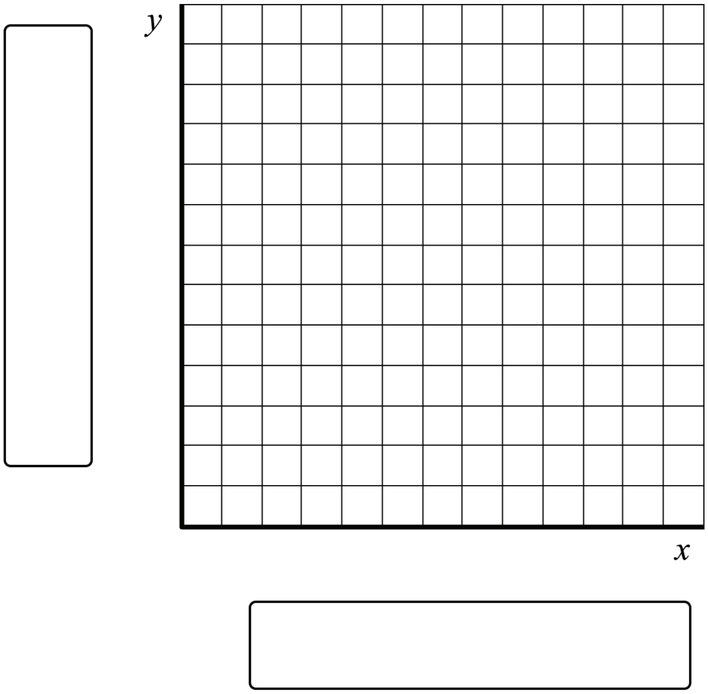
7.2 Write an expression to represent the total cost to use the cell phone plan for x months.



7.3 Make a graph of the cost of the cell phone plan over two years (24 months).

Be sure to:

- Label the axes.
- Label each grid line with a number.



7.4 A new cell phone plan costs $\$100$ to start. Then there is a $\$50$ charge each month.

Describe how **the graph** of this new plan would be the same and how it would be different.

Unit 8.3, End-Unit Assessment: Form A Name ______________________

Reflection: Select a question to answer.

- ☐ What is something you are proud of from this unit?

- ☐ Write what you know about a topic from this unit that you weren't asked about today.

- ☐ Describe or show one strategy you found helpful in this unit.
  Name any students who helped you with this strategy.

- ☐ What else would you like your teacher to know?

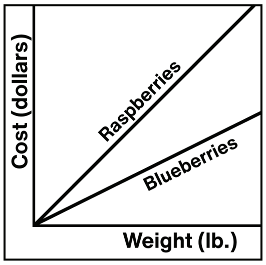
Answer Key

1. ✓ $(0,\ 5)$
   ✓ $(10,\ 0)$

2. B

3.

✓



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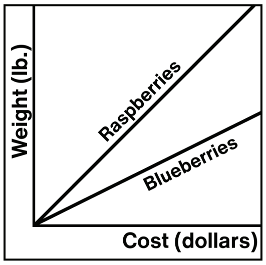
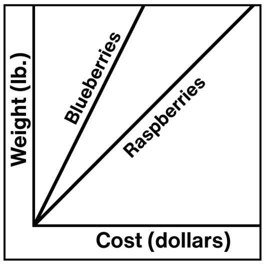


✓



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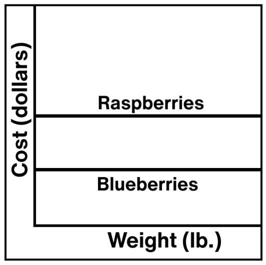


4.1 $y = 4$

4.2 $y = 4 - 2x$

4.3 $y = x - 1$

4.4 $x =- 4$

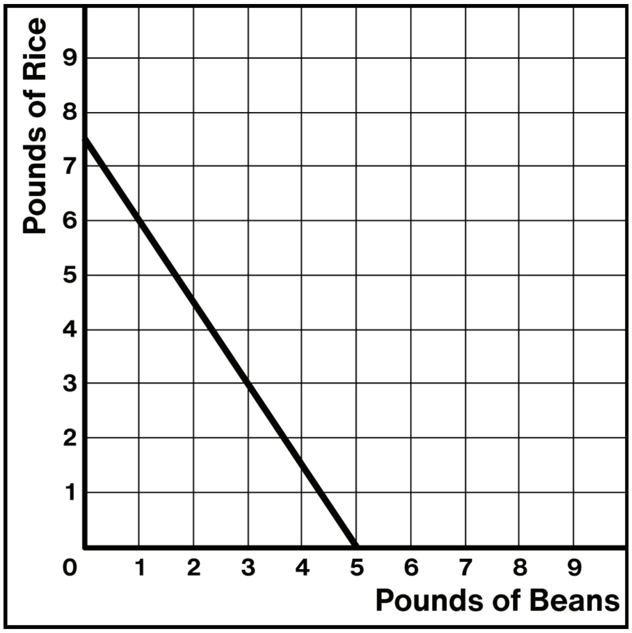
5. Runner 3
   Explanations vary. Runner 1's rate is 1 mile every 10 minutes. Runner 2's rate is 1 mile every 9 minutes, and Runner 3's rate is 1 mile every 8 minutes.

6.1

Pounds of Beans, b	Pounds of Rice, r
1	6
3	3
5	0

6.2 $1.5b + 1r = 7.5$

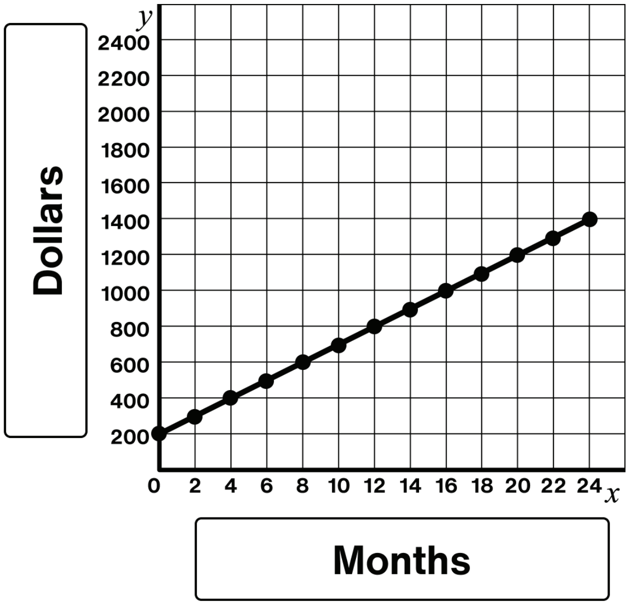
6.3



7.1 $\$300$

7.2 $200 + 50x$

7.3 *Responses vary.*



7.4 *Responses vary.* They have different vertical intercepts. They have the same slope. They are parallel to each other. One is a translation of the other.

Unit 8.3, End Assessment Summary and Rubric: Form A

Content Standards Summary

Standards	8.EE.B	8.EE.B.5	8.F.B.4
Problems	1, 4, 6.3, 7.1, 7.3, 7.4	3, 5, 6.1	2, 6.2, 7.2

Problem 1
(Standard: **8.EE.B**)

In this problem, students recognize what a solution to a linear equation in two variables means. This problem corresponds most directly to the work students did in Lesson 10: Solutions.

Suggested Next Steps: If students struggle . . .
- Consider having students rewrite the equation in slope-intercept form to support their thinking.
- Consider revisiting Lesson 10, Activity 1.

Problem 2
(Standards: **8.F.B.4, MP2**)

In this problem, students recognize how to interpret linear graphs that represent contexts. Students reason abstractly and quantitatively as they consider what the lines' relationship to each other means in context. This problem corresponds most directly to the work students did in Lesson 5: Flags.

Suggested Next Steps: If students struggle . . .
- Consider asking students to identify key features of the graph, such as whether the slope is positive or negative, what the apparent minimums and maximums are, and any points of intersection.
- Consider revisiting Lesson 5, Activity 3.

Unit 8.3, End Assessment Summary and Rubric: Form A

Problem 3

(Standards: **8.EE.B.5, MP6**)

In this problem, students recognize the meaning of slope in graphs without a scale. Students attend to precision when they decide on the appropriate relationship between the lines given the problem context and various axis labels. This problem corresponds most directly to the work students did in Lesson 1: Turtle Time Trials.

Suggested Next Steps: If students struggle . . .

- Consider drawing their attention to the way the axes are labeled and asking which should cost more if the same amount of each is purchased.
- Consider revisiting Lesson 1, Activity 1.

Problem 4

(Standards: **8.EE.B, MP7**)

In this problem, students write equations of lines with positive slope, negative slope, and horizontal and vertical lines. Students use the structure of the coordinate plane to write equations of lines. This problem corresponds most directly to the work students did in Lesson 9: Coin Capture.

Suggested Next Steps: If students struggle . . .

- Consider asking students to identify key features of the lines, such as the slope, y-intercept, or labeling two points on the graph.
- Consider revisiting Lesson 9, Activity 1.

Problem 5

(Standards: **8.EE.B.5, MP1**)

In this problem, students compare different proportional relationships given different representations of them. Students must make sense of the different data representations to determine a measure of growth that can be compared between the three situations. This problem corresponds most directly to the work students did in Lesson 3: Posters.

Suggested Next Steps: If students struggle . . .

- Consider asking students to determine the *slope* in each representation, then ask them which units they should use to measure the slope.
- Consider revisiting Lesson 3, Warm-Up and Activity 1.

Problem 6

(Standards: **8.EE.B, 8.EE.B.5, 8.F.B.4, MP2**)

In this problem, students recognize the relationship between the solutions of a situation in two variables, its equation, and its graph. Students reason abstractly and quantitatively when they use proportional relationships to solve problems in context. This problem corresponds most directly to the work students did in Lesson 10: Solutions.

Suggested Next Steps: If students struggle . . .

- Consider asking students to write separate expressions for the amount of money spent on beans and rice, then ask them how they can combine those expressions to represent the given context.
- Consider revisiting Lesson 10, Activity 1.

Unit 8.3, End Assessment Summary and Rubric: Form A

Problem 7

(Standards: **8.EE.B, 8.F.B.4, MP4**)

In this problem, students represent a situation with an initial value and rate of change with an equation and a graph. Students model with mathematics as they represent the given context as an equation and a graph. This problem corresponds most directly to the work students did in Lesson 5: Flags.

Suggested Next Steps: If students struggle . . .

- Consider asking students to write one expression for the fixed cost and another expression for the variable cost, then ask them how they can combine the two to represent the total bill.
- Consider revisiting Lesson 5, Activity 3.

Unit 8.3, End Assessment Summary and Rubric: Form A

Problem	Standard	Meeting/Exceeding	Approaching	Developing	Beginning	
		4	3	2	1	0
1	8.EE.B	Student selects both of the correct choices and does not select any incorrect choices. • $(0, 5)$ • $(10, 0)$	Student selects one of the correct choices and does not select any incorrect choices. Student selects both of the correct choices and one incorrect choice.	Student selects one of the correct choices and one incorrect choice.	Student only selects incorrect choices. Student selects two or more incorrect choices with correct choices.	Did not attempt.
2	8.F.B.4 MP2	• The highest temperature in Memphis decreased steadily.			Students who select "The highest temperature in Memphis increased each day" may be having trouble interpreting slope as a unit rate. Students who select " Initially, the highest temperature was warmer in Phoenix than in Memphis" may not understand the connection between the vertical intercept and an initial amount.	Did not attempt.
3	8.EE.B.5 MP6	Student selects both of the correct choices and does not select any incorrect choices. • Choice A • Choice C	Student selects one of the correct choices and does not select any incorrect choices. Student selects both of the correct choices and one incorrect choice.	Student selects one of the correct choices and one incorrect choice.	Student only selects incorrect choices. Student selects two or more incorrect choices with the correct choices.	Did not attempt.

Unit 8.3, End Assessment Summary and Rubric: Form A

Problem	Standard	Meeting/Exceeding	Approaching	Developing	Beginning	
		4	3	2	1	0
4.1	8.EE.B MP7	Work is complete and correct. • $y = 4$	Work shows conceptual understanding and mastery, with minor errors. • Students who write $x = 4$ or 4 may not understand the meaning of the equation of a line.	Work shows a developing but incomplete conceptual understanding, with significant errors. • Students who write $y = 4x$, or $y = 4x + 4$ may be familiar with the equation of a line, but not understand what each value represents.	Weak evidence of understanding.	Did not attempt.
4.2	8.EE.B MP7	Work is complete and correct. • $y = 4 - 2x$	Work shows conceptual understanding and mastery, with minor errors. • Students who write $y = 2x + 4$ may have correctly identified the y-intercept, but may not understand the difference between positive and negative slopes.	Work shows a developing but incomplete conceptual understanding, with significant errors. • Students who write $y = -2x$ or $y = 4$ may have correctly identified the y-intercept or slope, but not both.	Weak evidence of understanding.	Did not attempt.
4.3	8.EE.B MP7	Work is complete and correct. • $y = x - 1$	Work shows conceptual understanding and mastery, with minor errors. • Students who write $y = x + 1$ or $y = -x - 1$ may have correctly identified the slope or y -intercept, but made an error interpreting the signs.	Work shows a developing but incomplete conceptual understanding, with significant errors. • Students who write $y = 1x$ or $y = -1$ may have correctly identified the y-intercept or slope, but not both.	Weak evidence of understanding.	Did not attempt.

Unit 8.3, End Assessment Summary and Rubric: Form A

Problem	Standard	Meeting/Exceeding	Approaching	Developing	Beginning	
		4	**3**	**2**	**1**	**0**
4.4	8.EE.B MP7	Work is complete and correct. • $x = -4$	Work shows conceptual understanding and mastery, with minor errors. • Students who write $y = 4$ or 4 may recall that often the equation of a line begins with $y =$ [something].	Work shows a developing but incomplete conceptual understanding, with significant errors. • Students who write $y = -4x - 4$ may be familiar with the equation of a line, but not understand what each value represents.	Weak evidence of understanding.	Did not attempt.
5	8.EE.B.5 MP1	Student successfully answers the question and explains why. • Runner 3 Runner 1's rate is 1 mile every 10 minutes. Runner 2's rate is 1 mile every 9 minutes, and Runner 3's rate is 1 mile every 8 minutes.	Correct answer with minor flaws in explanation. Incorrect answer with logical and complete explanation. Students selecting Runner 1 may think that the greatest number of minutes per mile corresponds to the fastest pace.	Correct answer with incomplete explanation. Incorrect answer with explanation communicating partial understanding of interpreting rates. Students selecting Runner 2 may have only compared Runners 1 and 2 and concluded that Runner 2 was faster without considering Runner 3's equation.	Incorrect answer with incorrect explanation or without an explanation.	Did not attempt.

Unit 8.3, End Assessment Summary and Rubric: Form A

Problem	Standard	Meeting/Exceeding	Approaching	Developing	Beginning	
		4	3	2	1	0
6.1	8.EE.B.5 MP2	Work is complete and correct. • $(1, 6)$ • $(3, 3)$ • $(5, 0)$	Work shows conceptual understanding and mastery, with minor errors. Two of three rows correct.	Work shows a developing but incomplete conceptual understanding, with significant errors. One of three rows correct.	Weak evidence of understanding. Work does not consider the $\$7.50$ constraint.	Did not attempt.
6.2	8.F.B.4 MP2	Work is complete and correct. $1.5b + 1r = 7.5$ Correct equation based on an incorrect table in 6.1.	Work shows conceptual understanding and mastery, with minor errors.	Work shows a developing but incomplete conceptual understanding, with significant errors.	Weak evidence of understanding. Work does not consider the $\$7.50$ constraint.	Did not attempt.
6.3	8.EE.B MP2	Graph is complete and correct.	Work shows conceptual understanding and mastery, with minor errors. Graph contains only the three points from the table, even if the table is incorrect.	Work shows a developing but incomplete conceptual understanding, with significant errors. Reasonable graph that includes a line but is not based on the given relationship.	Weak evidence of understanding.	Did not attempt.

Unit 8.3, End Assessment Summary and Rubric: Form A

Problem	Standard	Meeting/Exceeding	Approaching	Developing	Beginning	
		4	3	2	1	0
7.1	8.EE.B	Work is complete and correct. • $\$300$	Work shows conceptual understanding and mastery, with minor errors.	Work shows a developing but incomplete conceptual understanding. • Students who write $\$500$ may have calculated the cost for 1 month and then doubled it.	Weak evidence of understanding.	Did not attempt.
7.2	8.F.B.4 MP4	Work is complete and correct. • $200 + 50x$ (or equivalent)	Work shows conceptual understanding and mastery, with minor errors.	Work shows a developing but incomplete conceptual understanding, with significant errors. • Students who write $50 + 200x$ (or equivalent) may recognize that the relationship is linear.	Weak evidence of understanding.	Did not attempt.
7.3	8.EE.B MP4	Work is complete and correct. Graph is scaled correctly and shows the cost up to the 24 months. The graph may be a continuous line, or it may consist only of points representing whole numbers of months.	Work shows conceptual understanding and mastery, with minor errors. Graph is reasonable, but the axis scales contain minor errors. Graph contains only a subset of points that would fit within the chosen scale.	Work shows a developing but incomplete conceptual understanding, with significant errors. The scale of the graph is chosen so as not to show all of the relevant points. Graph has the correct slope but does not include the starting cost.	Weak evidence of understanding.	Did not attempt.

Unit 8.3, End Assessment Summary and Rubric: Form A

Problem	Standard	Meeting/Exceeding	Approaching	Developing	Beginning	
		4	**3**	**2**	**1**	**0**
7.4	8.EE.B	Work is complete and correct. • They have different vertical intercepts. They have the same slope. They are parallel to each other. One is a translation of the other.	Work shows conceptual understanding and mastery, with minor errors. Response only describes how the graphs would be the same or different, but not both.	Work shows a developing but incomplete conceptual understanding, with significant errors. Response discusses the context but does not compare the graphs.	Weak evidence of understanding.	Did not attempt.

Unit 8.4, Readiness Check Name ______________________

Problem 1

Which of these expressions is equivalent to $3(x-2)$?

A. $3x-6$

B. $3x-2$

C. $3x+2$

D. $3x+6$

Problem 2

Which of these expressions is equivalent to $-2(x-5)$?

A. $-2x-5$

B. $-2x+5$

C. $-2x+10$

D. $-2x-10$

Problem 3

For each expression, combine like terms and write an equivalent expression with the fewest number of terms.

3.1 $4x+3x$	3.2 $3x+5x-1$
3.3 $5+2x+7+4x$	3.4 $4-2x+5x$
3.5 $10x-5+3x-2$	

 Name ____________________

Problem 4

For each equation, find a value for x that makes the equation true.

4.1 $x \div 3 = 12$	4.2 $2x + 3 = 20$	4.3 $\frac{4}{3}x = \frac{10}{3}$
4.4 $-4x = -24$	4.5 $2(x - 4) = 10$	4.6 $-0.5x + 1.1 = -2.9$

 Name ________________________________

Problem 5

For each equation, determine whether $x = 2$ is a solution.

5.1 $-2(x-4) = 4$	5.2 $\frac{26}{x} = 13$
5.3 $-3.8x = -7.4$	5.4 $4(x-1) - 3(x-2) = -8$

1. A. $3x - 6$

2. C. $-2x + 10$

3.1 $7x$

3.2 $8x - 1$

3.3 $6x + 12$

3.4 $4 + 3x$

3.5 $13x - 7$

4.1 $x = 36$

4.2 $x = \frac{17}{2}$ (or equivalent)

4.3 $x = \frac{5}{2}$ (or equivalent)

4.4 $x = 6$

4.5 $x = 9$

4.6 $x = 8$

5.1 Yes, because $-2(2 - 4) = 4$.

5.2 Yes, because $\frac{26}{2} = 13$.

5.3 No, because $(-3.8) \cdot 2 \neq -7.4$.

5.4 No, because $4(2 - 1) - 3(2 - 2) \neq -8$.

Unit 8.4, Readiness Check Summary

For teachers who choose to spread out the questions, consider assigning the following:

- Problem 3 before Lesson 2
- Problems 1, 4, and 5 before Lesson 3
- Problem 2 before Lesson 6

Problem 1

(Standard: **6.EE.A.3**)

This question is intended to surface what students already know about the distributive property. This content first appears in Lesson 3: Balanced Moves, where students can use the distributive property to support them in solving equations.

Suggested Next Steps: If students struggle . . .

- Plan to review the distributive property before Lesson 3, Activity 1. Consider using hanger diagrams as a context for reviewing the distributive property. Another opportunity to practice using the distributive property appears in Lesson 7.

Problem 2

(Standard: **6.EE.A.3**)

This question is intended to surface what students already know about the distributive property, especially involving multiplication with negative numbers. This content first appears in Lesson 6: Strategic Solving, where students describe strategies for solving linear equations with one variable that have different features or structures.

Suggested Next Steps: If students struggle . . .

- Plan to revisit this question before Lesson 6. Consider inviting students to choose a few values to substitute for x to verify their choice of equivalent expressions. (Note: This method is not sufficient for judging equivalent expressions.)

Problem 3

(Standard: **6.EE.A.3**)

This question is intended to surface what students already know about combining like terms. This content first appears in Lesson 2: Keep it Balanced, where students critique the reasoning of others in solving a linear equation with one variable.

Suggested Next Steps: If students struggle . . .

- Plan to ask them to write expressions in Lesson 4 in different ways, using the hanger diagram to emphasize that $x + 5x$ is equivalent to $6x$. Each hanger diagram in the lessons offers an opportunity to write equivalent expressions that support students in combining like terms.

Problem 4

(Standards: **7.EE.B.4.A, 6.EE.B.7**)

This question is intended to surface different strategies students use to solve equations with one instance of a variable. This content first appears in Lesson 3: Balanced Moves, where students make connections between changes on hanger diagrams and moves that create equivalent equations.

Suggested Next Steps: If students struggle . . .

- Plan to revisit this item before Lesson 4 and after students have worked with the hanger diagrams. Work with the hangers should support students with making decisions about equation-solving moves.

Problem 5

(Standards: **6.EE.B.5, MP8**)

This question is intended to surface what students already know about what it means for a value of a variable to be a solution to an equation. Students look for an express regularity in repeated reasoning as they substitute $x = 2$ and apply the order of operations in each problem. This content first appears in Lesson 3: Balanced Moves, where students first solve equations written with variables.

Suggested Next Steps: If students struggle . . .

- Beginning in Lesson 3, Activity 1, invite them to check the solutions they calculate by substituting values back into equations. Emphasize that a solution to an equation is a value for the variable that makes the equation true.

 Name ____________________

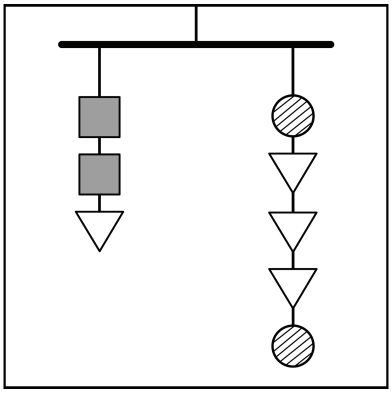
1. Here is a balanced hanger diagram. If a square weighs 12 grams and a circle weighs 9 grams, what does a triangle weigh?

   A. 2 grams

   B. 3 grams

   C. 4 grams

   D. 5 grams



2. Select **all** of the equations that are true for all values of x.

   ☐ $7x = 7x$

   ☐ $10 - 19 + 12x = 4x - 9 + 8x$

   ☐ $x \bullet 2 \bullet (-6) = x \bullet 3 \bullet 4$

   ☐ $\frac{1}{2}(6x + 5) = 3x + 2.5$

   ☐ $x - 6 = 6 - x$

Liam, Anika, and Sai are each solving the same equation for x. Describe the first step they each make for the equation.

Original equation: $12x + 4 = 20x - 12$

3.1 The result of Liam's first step was $4 = 8x - 12$.	3.1 The result of Anika's first step was $3x + 1 = 5x - 3$.	3.1 The result of Sai's first step was $12x + 16 = 20x$.

Unit 8.4, Quiz: Lessons 1–8 Name ______________________________________

Imani and Esteban each have different audiobook club memberships:

- Imani's book club costs $\$10$ for the membership and then $\$5$ per book.
- Esteban's book club costs $\$16$ for the membership and then $\$2$ per book.

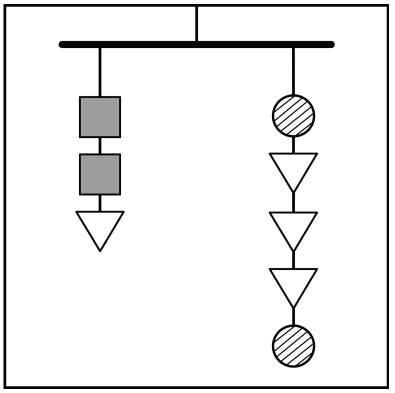
4.1 After listening to 4 audiobooks, whose book club costs more? Explain how you know.	4.2 After how many audiobooks will both book clubs cost the same total amount?

Solve each equation. Explain or show your reasoning.

5.1 $1d + 12 = 14 - 2d$	5.2 $4(2r + 5) = 10r$
5.3 $-2(5 + x) - 1 = 3(x + 3)$	

Answer Key

1. Here is a balanced hanger diagram. If a square weighs 12 grams and a circle weighs 9 grams, what does a triangle weigh?



   A. 2 grams

   B. 3 grams

   C. 4 grams

   D. 5 grams

2. Select **all** of the equations that are true for all values of x.

   ✓ $7x = 7x$

   ✓ $10 - 19 + 12x = 4x - 9 + 8x$

   ☐ $x \cdot 2 \cdot (-6) = x \cdot 3 \cdot 4$

   ✓ $\frac{1}{2}(6x + 5) = 3x + 2.5$

   ☐ $x - 6 = 6 - x$

Liam, Anika, and Sai are each solving the same equation for x. Describe the first step they each make for the equation.

Original equation: $12x + 4 = 20x - 12$

3.1 The result of Liam's first step was $4 = 8x - 12$. ***Responses vary.* Liam subtracted $12x$ from each side.**	3.2 The result of Anika's first step was $3x + 1 = 5x - 3$. ***Responses vary.* Anika divided each term in the equation by 4.**	3.3 The result of Sai's first step was $12x + 16 = 20x$. ***Responses vary.* Sai added 12 to each side.**

Answer Key

Imani and Esteban each have different audiobook club memberships:

- Imani's book club costs $\$10$ for the membership and then $\$5$ per book.
- Esteban's book club costs $\$16$ for the membership and then $\$2$ per book.

4.1 After listening to 4 audiobooks, whose book club costs more? **Imani's book club** Explain how you know. ***Responses vary.*** **After 4 books, Imani's book club total is $\$30$ and Esteban's total is $\$24$.**	4.2 After how many audiobooks will both book clubs cost the same total amount? 2 **audiobooks**

Solve each equation. Explain or show your reasoning.

5.1 $1d + 12 = 14 - 2d$ $d = \frac{2}{3}$	5.2 $4(2r + 5) = 10r$ $r = 10$
5.3 $-2(5 + x) - 1 = 3(x + 3)$ $x = -4$	

Unit 8.4, Quiz: Summary and Rubric

Content Standards Summary

Standard	8.EE.C	8.EE.C.7	8.EE.C.7.A	8.EE.C.7.B
Problems	1	3, 4	2	5

Problem 1

(Standards: **8.EE.C, MP7**)

In this problem, students calculate the weight of an unknown object using a hanger diagram and explain the solution method. Students use the structure of the hangar diagram to solve an algebraic equation. This problem corresponds most directly to the work students did in Lesson 2: Keep It Balanced.

Suggested Next Steps: If students struggle . . .

- Consider reminding students of balancing moves, such as subtracting weights from both sides of the hanger, or pairing up groups of shapes on both sides in equally weighted pairs.
- Consider revisiting Lesson 2, Activity 2.

Problem 2

(Standard: **8.EE.C.7.A**)

In this problem, students determine whether or not equations have infinitely many solutions. This problem corresponds most directly to the work students did in Lesson 7: All, Some, or None?

uggested Next Steps: If students struggle . . .

Consider asking students to combine like terms in each equation, then substitute a few test values. (Note: This method is not sufficient for judging equivalent expressions, but can help students get started.)

Consider revisiting Lesson 7, Activities 1 and 2.

Unit 8.4, Quiz: Summary and Rubric

Problem 3

(Standards: **8.EE.C.7, MP3**)

In this problem, students describe the reasoning of others in solving a linear equation with one variable. This problem corresponds most directly to the work students did in Lesson 4: More Balanced Moves.

Suggested Next Steps: If students struggle . . .

- Consider reminding students of valid balancing moves, then ask them which ones were used by Liam, Anika, and Sai.
- Consider revisiting Lesson 4, Activity 1.

Problem 4

(Standards: **8.EE.C.7, MP2**)

In this problem, students solve a problem in which two conditions are equal. Students reason abstractly and quantitatively as they determine and compare variable quantities in context. This problem corresponds most directly to the work students did in Lesson 8: When Are They the Same?

Suggested Next Steps: If students struggle . . .

- Consider asking students to determine the cost after 1 book, then 2 books, etc.
- Consider revisiting Lesson 8, Activity 1.

Problem 5

(Standard: **8.EE.C.7.B**)

this problem, students calculate a value that is a solution to a linear equation with one variable. This problem corresponds most rectly to the work students did in Lesson 5: Equation Roundtable.

uggested Next Steps: If students struggle . . .

Consider reminding students of valid balancing moves. Encourage students to use balancing moves to group like terms together on the same side of the equation before combining them.

Consider revisiting Lesson 5, Activity 1.

Unit 8.4, Quiz: Summary and Rubric

Problem	Standard	Meeting/Exceeding	Approaching	Developing	Beginning	
		4	3	2	1	0
1	8.EE.C, MP7	Correct choice. • B. 3 grams			Incorrect choice. *E.g., Students who select "2 grams" may have removed a triangle from each side, leaving 2 triangles remaining.*	Did not attempt.
2	8.EE.C.7.A	**All correct** choices and **no incorrect** choices. • $7x = 7x$ • $10 - 19 + 12x = 4x - 9 + 8x$ • $\frac{1}{2}(6x + 5) = 3x + 2.5$	**One or two correct** choices and **no incorrect** choices. **All correct** choices and **one incorrect** choice.	**One or two correct** choices but also includes **one incorrect** choice.	**Only incorrect** choices. **Both incorrect** choices with some correct choices.	Did not attempt.
3.1	8.EE.C.7, MP3	Work is complete and correct. *E.g., Liam subtracted $12x$ from each side.*	Work shows **conceptual understanding**, with minor errors. *E.g., Liam subtracted 12 from each side.*	Work shows a developing but **incomplete understanding**, with significant errors. *E.g., Liam combined the $12x$ and $20x$.* *E.g., Liam got rid of the $12x$.*	Work shows **limited understanding**.	Did not attempt.

Unit 8.4, Quiz: Summary and Rubric

Problem	Standard	Meeting/Exceeding	Approaching	Developing	Beginning	
		4	3	2	1	0
3.2	8.EE.C.7, MP3	Work is complete and correct. *E.g., Anika divided each term in the equation by* 4.	Work shows **conceptual understanding**, with minor errors. *E.g.,* Anika divided each term in the equation by $\frac{1}{4}$.	Work shows a developing but **incomplete understanding**, with significant errors. *E.g., Anika wrote the equation with smaller numbers.*	Work shows **limited understanding**.	Did not attempt.
3.3	8.EE.C.7, MP3	Work is complete and correct. *E.g., Sai added* 12 *to each side.*	Work shows **conceptual understanding**, with minor errors. *E.g., Sai added* 12 *and* 4.	Work shows a developing but **incomplete understanding**, with significant errors. *E.g., Sai combined the* 4 *and the* 12. *E.g., Sai got rid of the* 12.	Work shows **limited understanding**.	Did not attempt.
4.1	8.EE.C.7, MP2	Correct answer with correct explanation. *E.g., Imani's book club. After* 4 *books, Imani's book club total is* $30 *and Esteban's total is* $24.	Work shows **conceptual understanding** with some errors. *E.g., Esteban's book club. After* 4 *books, Imani's book club total is* $30 *and Esteban's total is* $24.	Work shows **incomplete understanding** with significant errors. *E.g., Imani's book club. Imani's book club costs more.*	Work shows **limited understanding**.	Did not attempt.

Unit 8.4, Quiz: Summary and Rubric

Problem	Standard	Meeting/Exceeding	Approaching	Developing	Beginning	
		4	**3**	**2**	**1**	**0**
4.2	8.EE.C.7, MP2	Work is complete and correct. *E.g., 2 audiobooks*	Work shows **conceptual understanding**, with minor errors. *E.g., Students who write* 20 *may have determined the amount when both book clubs cost the same price.*	Work shows a developing but **incomplete understanding**, with significant errors. *E.g., They will never cost the same amount because they are different prices.*	Work shows **limited understanding**.	
5.1	8.EE.C.7.B	Work is complete and correct. *E.g.,* $d = \frac{2}{3}$	Work shows **conceptual understanding**, with minor errors. *E.g., Students who write* $d = \frac{3}{2}$ *may have made an error solving* $3d = 2$ *for* d.	Work shows a developing but **incomplete understanding**, with significant errors. *E.g., Students who write* -26 *may have added like terms on each side of the equation.*	Work shows **limited understanding**.	Did not attempt.
5.2	8.EE.C.7.B	Work is complete and correct. *E.g.,* $r = 10$	Work shows **conceptual understanding**, with minor errors.	Work shows a developing but **incomplete understanding**, with significant errors. *E.g., Students who write* $r = \frac{5}{2}$ *may have distributed the* 4 *to the first term in the parentheses.*	Work shows **limited understanding**.	Did not attempt.

Unit 8.4, Quiz: Summary and Rubric

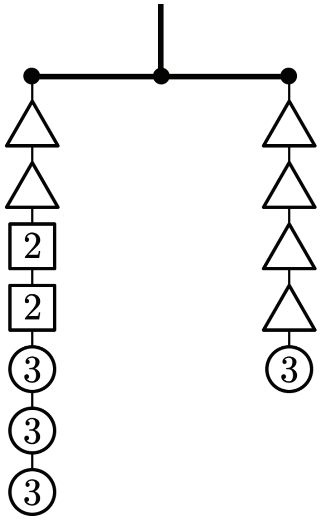
Problem	Standard	Meeting/Exceeding	Approaching	Developing	Beginning	
		4	**3**	**2**	**1**	**0**
5.3	8.EE.C.7.B	Work is complete and correct. *E.g.,* $x = -4$	Work shows **conceptual understanding**, with minor errors. *E.g., Students who write* $x = 4$ *may have solved the equation correctly, but forgot the negative.*	Work shows a developing but **incomplete understanding**, with significant errors. *E.g., Students who write* $x = -\frac{17}{5}$ *may have distributed the* -2 *to all of the terms on the left side of the equation.*	Work shows **limited understanding**.	

Unit 8.4, End-Unit Assessment: Form A Name ______________________________

1. Here is a balanced hanger diagram.

   A circle weighs 3 grams and a square weighs 2 grams.

   What is the weight of a triangle?

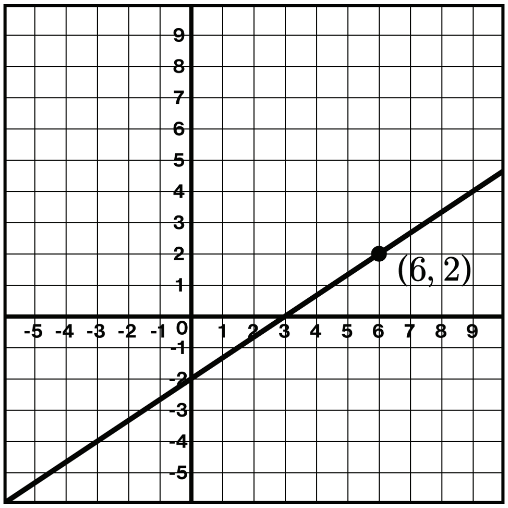


   A. $\frac{8}{3}$ grams B. 10 grams

   C. 16 grams D. 5 grams

2. A system of two equations has the solution $(6, 2)$. Here is a graph of one of the equations.

   What could the other equation be?



   A. $y = 4x - 2$ B. $y = \frac{2}{3}x - 1$

   C. $y = \frac{1}{2}x - 1$ D. $y = -\frac{3}{2}x + 6$

3. Which system of equations has exactly one solution?

   A. $y = 3x + 1$, $y = -3x + 7$ B. $y = 3x + 1$, $y = 3x + 7$ C. $y = x + 10$, $2y = 2x + 20$ D. $y = -x + 10$, $y = -x + 12$

   Explain your thinking.

Unit 8.4, End-Unit Assessment: Form A Name ____________________________________

Solve these equations.

4.1 $2x - 4 = 5 - 3x$

4.2 $3x + 30 + x = 10 + 2x + 5x + 2$

4.3 $3(x - 7) = 2(x - 12)$

5. Solve this system of equations. Write your answer as an ordered pair (x, y).

$$3x + 4y = 36$$

$$y = -\frac{1}{2}x + 8$$

Unit 8.4, End-Unit Assessment: Form A Name ____________________

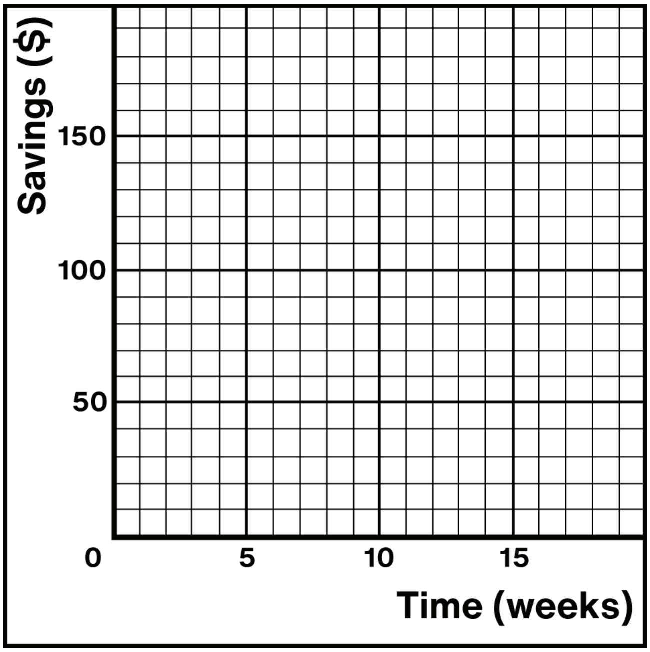
Josiah and Kiri are each saving money.

- Josiah starts with $\$100$ in savings and saves $\$5$ per week.
- Kiri starts with $\$40$ in savings and saves $\$10$ each week.

6.1 After 4 weeks, who has more money in savings?
Explain your thinking.

6.2 After how many weeks will Josiah and Kiri have the same amount of money in savings?

Use the graph if it helps with your thinking.



Unit 8.4, End-Unit Assessment: Form A Name ______________________________

Tay is making jam. Their recipe calls for 3 strawberries for each apple.

7.1 Complete the table so that each row matches Tay's recipe.

Apples, x	**Strawberries, y**
	3
8	
	15
3	

7.2 Tay used 52 pieces of fruit altogether.
They wrote two equations, where x is the number of apples and y is the number of strawberries:

$$y = 3x$$
$$52 = x + y$$

How many apples and strawberries did Tay use?
Show or explain your reasoning.

Reflection: Select a question and answer it below.

- ☐ What is something you are proud of from this unit?
- ☐ Write what you know about a topic from this unit that you weren't asked about today.
- ☐ Describe or show one strategy you found helpful in this unit.
  Name any students who helped you with this strategy.
- ☐ What else would you like your teacher to know?

Answer Key

1. D. 5 grams

2. C. $y = \frac{1}{2}x - 1$

3. A. $y = 3x + 1$
   $y = -3x + 7$

   Explanations vary. Each line in this system of equations has a different slope, so I know they are not parallel and they are not the same line. They would intersect at exactly one point.

4.1 $x = \frac{9}{5}$ (or equivalent)

4.2 $x = 6$

4.3 $x = -3$

5. $(4,\ 6)$

6.1 Josiah

Explanations vary. Josiah has \$120 because $120 = 100 + 4 \cdot 5$. Kiri has \$80 because $80 = 40 + 4 \cdot 10$.

6.2 12 weeks

Explanations vary. The number of weeks is the solution to $100 + 5n = 40 + 10n$. The solution is $n = 12$. After 12 weeks, Joshiah and Kiri each have \$160 in their savings accounts.

7.1

Apples, x	**Strawberries, y**
1	3
8	24
5	15
3	9

7.2 13 apples
39 strawberries

Explanations vary. Solving the system of equations using substitution means $52 = x + (3x)$. Then $52 = 4x$, so $13 = x$. Substituting $13 = x$ into $y = 3x$, I found that $y = 39$.

Unit 8.4, End Assessment Summary and Rubric: Form A

Content Standards Summary

Standard	8.EE.C.7	8.EE.C.7.A	8.EE.C.7.B	8.EE.C.8.A	8.EE.C.8.B	8.EE.C.8.C
Problems	1, 6	3	4	2	5	7

Problem 1

(Standard: **8.EE.C.7**)

In this problem, students determine the weight of an unknown object using a hanger diagram. This problem corresponds directly to the work students did in Lesson 2: Keep It Balanced.

Suggested Next Steps: If students struggle . . .

- Consider asking students to sum all known quantities on each side, then all unknowns, and write an equation using their sums.
- Consider revisiting Lesson 2, Activities 1 and 2.

Problem 2

(Standards: **8.EE.C.8.A, MP7**)

In this problem, students recognize what a solution to a system of equations means. Students use the structure of the coordinate plane to reason about solutions to equations in two variables. This problem corresponds most directly to the work students did in Lesson 12: Line Zapper.

Suggested Next Steps: If students struggle . . .

- Consider asking students what it means for an ordered pair to be a solution to an equation, and encourage them to use substitution to check their options.
- Consider revisiting Lesson 12, Activity 1.

Problem 3

(Standard: **8.EE.C.7.A**)

In this problem, students determine whether a system of equations has one solution, infinitely many, or no solutions. This problem corresponds most directly to the work students did in Lesson 13: All, Some, or None? Part 2.

Suggested Next Steps: If students struggle . . .

- Consider asking students what exactly one solution to a system of equations looks like graphically. Then ask how the slope and y-intercept can help them determine the property they are seeking.
- Consider revisiting Lesson 13, Activity 1.

Problem 4

(Standard: **8.EE.C.7.B**)

In this problem, students calculate a value that is a solution to a linear equation with one variable. This problem corresponds most directly to the work students did in Lesson 4: More Balanced Moves.

Suggested Next Steps: If students struggle . . .

- Consider reminding students of valid balancing moves. Encourage students to use balancing moves to group like terms on one side of the equation before combining like terms.
- Consider revisiting Lesson 4, Activity 1.

Unit 8.4, End Assessment Summary and Rubric: Form A

Problem 5

(Standard: **8.EE.C.8.B**)

In this problem, students calculate values that are solutions to a system of equations. This problem corresponds most directly to the work students did in Lesson 13: All, Some, or None? Part 2.

Suggested Next Steps: If students struggle . . .

- Consider reminding students of their choices for solution methods, such as substitution, graphing, or setting two expressions equal to each other.
- Consider revisiting Lesson 13, Activity 1.

Problem 6

(Standards: **8.EE.C.7, MP2**)

In this problem, students determine a point that satisfies two relationships simultaneously using a table or a graph. Students reason abstractly and quantitatively as they set up and solve equations representing a context. This problem corresponds most directly to the work students do in Lesson 9: On or Off the Line?

Suggested Next Steps: If students struggle . . .

- Consider asking students to determine the savings after 1 week, 2 weeks, etc. Then have students use their work to determine equations for both savings accounts.
- Consider revisiting Lesson 9, Activity 1.

Problem 7
(Standard: **8.EE.C.8.C**)

In this problem, students calculate a solution to a system of equations in context. It corresponds most directly to the work students did in Lesson 9: On or Off the Line? and Lesson 14: Strategic Solving Part 2.

Suggested Next Steps: If students struggle . . .
- Consider reviewing the term *proportional relationship* and asking students what the *constant of proportionality* in this situation is.
- Consider revisiting Lesson 9, Activity 1 or Lesson 14, Activity 1.

Unit 8.4, End Assessment Summary and Rubric: Form A

Problem	Standard	Meeting/Exceeding	Approaching	Developing	Beginning	
		4	3	2	1	0
1	8.EE.C.7	• 5 grams			Students who select 10 grams may have removed the equivalent shapes from both sides of the hanger and noticed that one side had 10 grams remaining. Students who select $\frac{8}{3}$ grams may have noticed that the hanger includes 16 grams total and that there are 6 triangles, and then solved the equation $16 = 6x$. Students who select 16 grams added the weights of all the circles and squares together.	Did not attempt.
2	8.EE.C.8.A, MP7	• $y = \frac{1}{2}x - 1$			Students who select $y = -\frac{3}{2}x + 6$ may have drawn the line, but used a slope of $-\frac{2}{3}$. Students who select $y = 4x - 2$ may have noticed that the point $(2, 6)$ is on the line. Students who select $y = \frac{2}{3}x - 1$ have selected a line parallel to the given line, but with a different y-intercept.	Did not attempt.

Unit 8.4, End Assessment Summary and Rubric: Form A

Problem	Standard	Meeting/Exceeding	Approaching	Developing	Beginning	
		4	3	2	1	0
3	8.EE.C.7.A	Student selects all of the correct choices and does not select any incorrect choices. • $y = 3x + 1$ $y = -3x + 7$ Each line in this system of equations has a different slope, so I know they are not parallel and they are not the same line. They would intersect at exactly one point.			Students who select $y = x + 10$ $2y = 2x + 20$ may have only looked at the right side of each equation.	Did not attempt.
4.1	8.EE.C.7.B	Work is complete and correct. • $x = \frac{9}{5}$	Work shows conceptual understanding and mastery, with minor errors. Student work includes a minor calculation error.	Work shows a developing but incomplete conceptual understanding, with significant errors. Student work includes some conceptual errors.	Weak evidence of understanding.	Did not attempt.
4.2	8.EE.C.7.B	Work is complete and correct. • $x = 6$	Work shows conceptual understanding and mastery, with minor errors. Student work includes a minor calculation error.	Work shows a developing but incomplete conceptual understanding, with significant errors. Student work includes some conceptual errors.	Weak evidence of understanding.	Did not attempt.

Unit 8.4, End Assessment Summary and Rubric: Form A

Problem	Standard	Meeting/Exceeding	Approaching	Developing	Beginning	
		4	3	2	1	0
4.3	8.EE.C.7.B	Work is complete and correct. • $x = -3$	Work shows conceptual understanding and mastery, with minor errors. • Students who write $x = 3$ may have solved the equation correctly, but forgot the negative.	Work shows a developing but incomplete conceptual understanding, with significant errors. • Students who write $x = 5$ may have only distributed the coefficients to the first term in each parentheses. • Students who write $x = -9$ may have distributed correctly but solved the equation by adding the like terms, and then correctly solving the equation $5x = -45$.	Weak evidence of understanding.	Did not attempt.
5	8.EE.C.8.B	Work is complete and correct. • $(4, 6)$	Work shows conceptual understanding and mastery, with minor errors. • Students who write $(4, 10)$ may have correctly solved for the value of x but then did not consider the negative when substituting into $y = -\frac{1}{2}x + 8$.	Work shows a developing but incomplete conceptual understanding, with significant errors. • Students who write $(28, -6)$ may have only distributed 4 to the first term in $-\frac{1}{2}x + 8$ when substituting.	Weak evidence of understanding.	

Unit 8.4, End Assessment Summary and Rubric: Form A

Problem	Standard	Meeting/Exceeding	Approaching	Developing	Beginning	
		4	3	2	1	0
6.1	8.EE.C.7, MP2	Student successfully answers the question and includes a logical and complete explanation. • Josiah Josiah has $\$120$ because $120 = 100 + 4(5)$. Kiri has $\$80$ because $80 = 40 + 4(10)$.	Correct answer with minor flaws in explanation. Incorrect answer with logical and complete explanation. • Students who respond "Kiri" may have considered only the amount they are saving per week.	Correct answer with incomplete explanation. Incorrect answer with explanation that communicates partial understanding of the situation.	Incorrect answer with incorrect explanation or without an explanation.	Did not attempt.
6.2	8.EE.C.7, MP2	Student successfully answers the question and includes a logical and complete explanation. • 12 weeks The number of weeks for them to have the same amount of money is the solution to $100 + 5n = 40 + 10n$. After 12 weeks, Josiah and Kiri each have $\$160$ in their savings accounts.	Correct answer with minor flaws in explanation. Incorrect answer with logical and complete explanation.	Correct answer with incomplete explanation. Incorrect answer with explanation that communicates partial understanding of the situation. • Students who say 6 weeks may have determined how many weeks until Kiri has $\$100$.	Incorrect answer with incorrect explanation or without an explanation.	Did not attempt.

Unit 8.4, End Assessment Summary and Rubric: Form A

Problem	Standard	Meeting/Exceeding	Approaching	Developing	Beginning	
		4	**3**	**2**	**1**	**0**
7.1	8.EE.C.8.C	Work is complete and correct. • $(1, 3)$ • $(8, 24)$ • $(5, 15)$ • $(3, 9)$	Student correctly completes the table for three of the four values, most likely the result of a calculation error.	Work shows a developing but incomplete conceptual understanding, with significant errors. Student correctly completes the table for two of the four values.	Weak evidence of understanding. • Students who write 11 strawberries for 8 apples may have used addition instead of multiplication.	Did not attempt.
7.2	8.EE.C.8.C	Student successfully answers the question and includes a logical and complete explanation. • 13 apples 39 strawberries Using substitution, $52 = x + (3x)$. Then $52 = 4x$, so $13 = x$. Substituting 13 for x into $y = 3x$, $y = 39$.	Correct answer with minor flaws in explanation. Incorrect answer with logical and complete explanation.	Correct answer with incomplete explanation. Incorrect answer with explanation that communicates partial understanding of the situation. • Students who say 49 apples and 3 strawberries may have thought the first equation in the system was $y = 3$.	Incorrect answer with incorrect explanation or without an explanation.	Did not attempt.

You will need a calculator for this assessment.

Problem 1

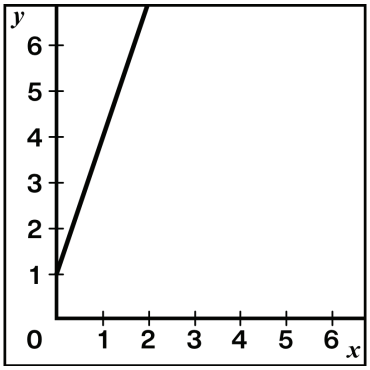
Juana is three years older than twice her brother's age.

Select **all** of the equations that represent the relationship between Juana's age, j, and her brother's age, b.

- ☐ $j = 2b + 3$
- ☐ $j = 2(b + 3)$
- ☐ $j = \frac{b}{2} - 3$
- ☐ $b = 2j + 3$
- ☐ $b = \frac{j-3}{2}$
- ☐ $b = \frac{j}{2} - 3$

Problem 2

Select **all** of the proportional relationships.

- ☐ 

- ☐ A train is traveling at a constant speed of 60 miles per hour. The number of hours the train has been traveling is t. The number of miles the train has traveled is d.

- ☐ The relationship represented by this table:

x	y
3	6
4	12
5	24

- ☐ $y = 3x$, where x and y are both positive numbers.
- ☐ $y = \frac{1}{x}$

 Name ________________________________

Problem 3

There are 16 cups in a gallon.

The equation $c = 16g$ gives the number of cups in terms of the number of gallons.

Write an equation for this situation that gives the number of cups in terms of the number of gallons.

$$g =$$

Problem 4

Given the equation:

$$y = -3x + 2.5$$

4.1 When x is 1, what value of y makes the equation true?

4.2 When x is -1.5, what value of y makes the equation true?

4.3 When y is 8.5, what value of x makes the equation true?

Problem 5

A circular field has an area of 14400π square feet.

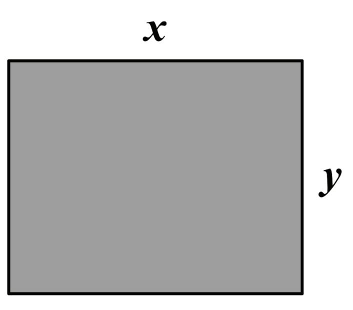
5.1 What is the radius of the field?

5.2 What is the diameter of the field?

5.3 What is the circumference of the field? Round your answer to the nearest foot.

Problem 6

A rectangle has length x and width y.



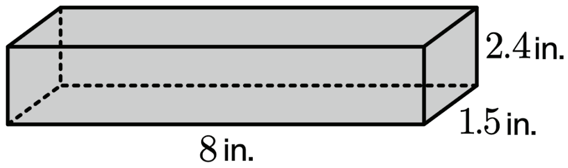
Select **all** of the statements that must be true.

- ☐ The perimeter is $x + y$.
- ☐ The perimeter is xy.
- ☐ The perimeter is $2\,(x + y)$.
- ☐ The perimeter is $2xy$.
- ☐ The perimeter is $2x + 2y$.
- ☐ The area is $x + y$.
- ☐ The area is xy.
- ☐ The area is $2xy$.

 Name ________________________________

Problem 7

Here is a rectangular prism.



7.1 What is the surface area of the prism? Show your thinking.

7.2 What is the volume of the prism? Show your thinking.

Answer Key

1. ✓ $j = 2b + 3$

   ✓ $b = \dfrac{j-3}{2}$

2. ✓ A train is traveling at a constant speed of 60 miles per hour. The number of hours the train has been traveling is t. The number of miles the train has traveled is d.

   ✓ $y = 3x$, where x and y are both positive numbers.

3. $g = \dfrac{1}{16}c$

4.1 $y = -\dfrac{1}{2}$

4.2 $y = 7$

4.3 $x = -2$

5.1 120 feet

5.2 240 feet

5.3 754 feet or 240π feet

6. ✓ The perimeter is $2(x + y)$.

   ✓ The perimeter is $2x + 2y$.

   ✓ The area is xy.

7.1 69.6 in.^{2}

7.2 28.8 in.^{3}

Unit 8.5, Readiness Check Summary

For teachers who choose to spread out the questions, consider assigning the following:

- Problem 6 before Lesson 3
- Problems 1, 3, and 4 before Lesson 4
- Problem 2 before Lesson 7
- Problems 5 and 7 before Lesson 11

Problem 1

(Standards: **7.EE.B.4, MP2**)

This question is intended to surface what students already know about writing equations to represent the relationship between quantities in context. This content first appears in Lesson 4: Window Frames, where students represent functions with equations.

Suggested Next Steps: If students struggle . . .

- Plan to review this problem as part of the Warm-Up for Lesson 4. Consider using tape diagrams to support students with connecting equations and situations.

Problem 2

(Standards: **7.RP.A.2.A, MP6**)

This question is intended to surface what students already know about representations of proportional and non-proportional relationships. Students attend to precision when they categorize each relationship. This content first appears in Lesson 7: Feel the Burn, where students compare inputs and outputs of functions that are represented in different ways.

Suggested Next Steps: If students struggle . . .

- Plan to revisit the definition of proportional relationships before Lesson 7. Students worked with these relationships in Unit 3: Linear Relationships, so it may be helpful to revisit practice problems from that unit.

Problem 3

(Standard: **7.RP.A.2.C**)

This question is intended to surface what students already know about representing the same proportional relationship with two different equations. This content first appears in Lesson 4: Window Frames, where students connect equations with independent and dependent variables.

Suggested Next Steps: If students struggle . . .

- Plan to spend extra time during the Synthesis of Lesson 4 discussing the relationship between the two equations. Students worked with this content in Math 7, Unit 2, Lesson 6: Two and Two. It may be helpful to revisit this lesson and the practice problems.

Problem 4

(Standards: **6.EE.A.2.C, 7.NS.A.1, 7.NS.A.2, MP8**)

This question is intended to surface what students already know about substituting numbers for variables and signed number arithmetic. Students express regularity in repeated reasoning as they substitute various x-values to determine corresponding y-values. This content first appears in Lesson 4: Window Frames, where students use equations of functions to solve problems.

Suggested Next Steps: If students struggle . . .

- Plan to revisit it before Lesson 4. Invite several students to share their strategies and ask a question like: *When might this strategy be helpful?*

Problem 5

(Standards: **7.G.B.4, MP2**)

This question is intended to surface what students already know about the relationship between the area and radius of a circle. Students reason abstractly and quantitatively to determine unknown quantities, then use those to determine new unknown quantities. This problem is especially helpful for thinking about when it is useful to use an approximation for π. If students begin by approximating π, the work is much harder. This content first appears in Lesson 11: Cylinders, where students calculate volumes of cylinders.

Suggested Next Steps: If students struggle . . .

- Plan to revisit this item at the end of Activity 1. Consider discussing the advantages and disadvantages of leaving a value as a multiple of π.

Problem 6

(Standards: **3.MD.D.8, 3.MD.C.7, MP6**)

This question is intended to surface what students already know about using expressions to represent perimeters and areas. Students attend to precision as they check whether the given expressions align with the given properties. This content first appears in Lesson 3: Function or Not?, where students examine functions and non-functions that represent perimeter and area.

Suggested Next Steps: If students struggle . . .

- Consider inviting students to revisit this question and revise their response after Lesson 3.

Problem 7

(Standard: **7.G.B.6**)

This question is intended to surface what students know about surface area and volume of prisms. This content first appears in Lesson 11: Cylinders, where students calculate volumes of cylinders.

Suggested Next Steps: If students struggle . . .

- Plan to spend time before Lesson 11 reviewing strategies for calculating volumes of rectangular prisms.

Unit 8.5, Quiz 1: Lessons 1–4 Name ______________________________

1. If the input, x, is 16, which equation would result in an output of 4?

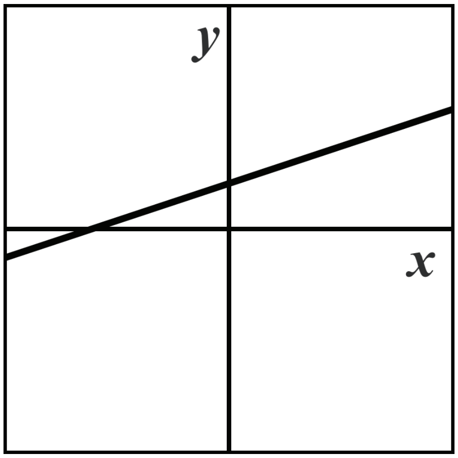
   A. $y = x^2$

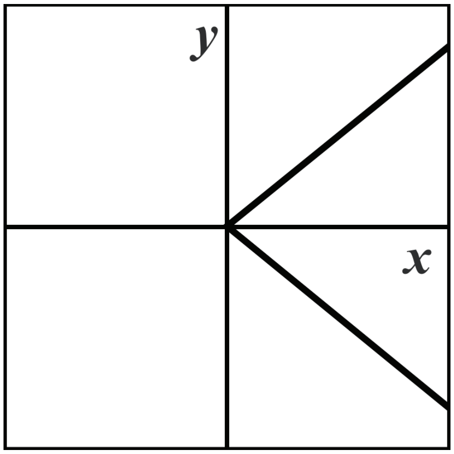
   B. $y = x + 12$

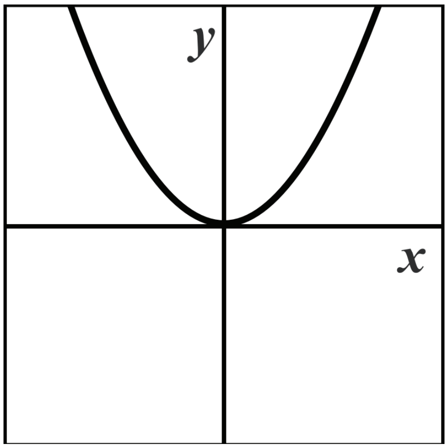
   C. $y = x - 20$

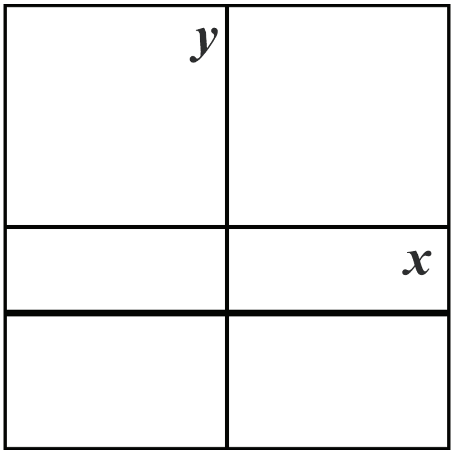
   D. $y = x - 12$

2. Select **all** of the graphs that represent y as a function of x.

☐ 

☐ 

☐ 

☐ 

3. Jaleel wrote a book. He wants to print some copies for his friends and family. The printing company charges a one-time fee of $\$200$, plus $\$2$ for each printed book.

   3.1 Is Jaleel's total cost a function of the number of books he prints? Explain your thinking.

   3.2 Is the number of books he prints a function of his total cost? Explain your thinking.

   3.3 Jaleel wrote the equation $c = 200 + 2b$, where c represents his total cost and b represents the number of books he printed. Identify the independent variable and the dependent variable for this equation.

   Independent variable:

   Dependent variable:

4. Adriana is planning to ride the public bus to and from school this year. She wants to figure out how much it will cost her. The bus ride costs $\$1.25$ each direction.

   4.1 Identify a quantity to be the independent variable and one to be the dependent variable for this situation. Then, explain your thinking.

Independent variable:	Explanation:
Dependent variable:	

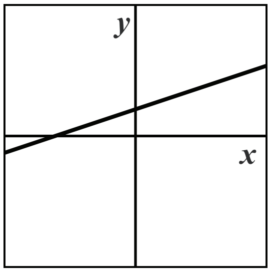
   4.2 Write an equation that describes the situation. Use x to represent the independent variable and y to represent the dependent variable.

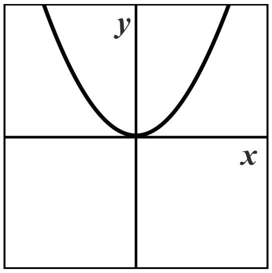
   4.3 How much will it cost Adriana to get to school and back home for a five-day week?

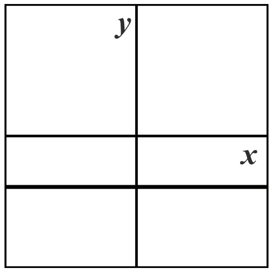
Answer Key

1. D. $y = x - 12$

2. Select **all** of the graphs that represent y as a function of x.

✓ 

✓ 

✓ 

3.1 *Responses vary.*

- Yes. For each number of books, there is only one possible cost.
- Yes. The number of books he chooses to print determines the cost.
- Yes. The cost depends on the number of books.

3.2 *Responses vary.*

- Yes. For each cost, there is only one possible number of books he can buy.
- Yes. The cost determines the number of books.
- Yes. The number of books he can print is dependent on the cost.

3.3 Independent variable: Books printed (b)
Dependent variable: Total cost (c)

4.1 *Responses vary.*

Independent variable: Number of bus rides

Dependent variable: Total cost

Explanation: Adriana's total cost depends on the number of rides that she takes.

4.2 *Responses vary depending on variables chosen in 4.1.*

$y = 1.25x$

4.3 $\$12.50$ (5 days means 10 bus trips. $1.25\,(10) = 12.5$.)

Unit 8.5, Quiz 1: Summary and Rubric

Content Standards Summary

Standard	8.F.A.1	8.F.B.4
Problems	1, 2, 3	4

Problem 1

(Standard: **8.F.A.1**)

In this problem, students make sense of a function written as an equation. This problem corresponds most directly to the work students did in Lesson 4: Window Frames.

Suggested Next Steps: If students struggle . . .

- Consider asking students to substitute the x-value into each equation, then perform the given operations.
- Consider revisiting Lesson 4, Activity 1.

Problem 2

(Standards: **8.F.A.1, MP6**)

In this problem, students determine whether a graph represents a function. Students attend to precisions as they classify each graph using the definition of a function. This problem corresponds most directly to the work students did in Lesson 3: Function or Not?

Suggested Next Steps: If students struggle . . .

- **Math Language Development** Consider using the mathematical language routine Critique, Correct, Clarify to help students understand the term *function* and how to determine if a graph represents a function.
- Consider revisiting Lesson 3, Activity 2, Screen 8.

Unit 8.5, Quiz 1: Summary and Rubric

Problem 3

(Standards: **8.F.A.1, MP2, MP6**)

In this problem, students determine whether a situation represents a function, and they identify independent and dependent variables in a function. Students reason abstractly and quantitatively to represent the given context with various equations. Students attend to precision as they consider the definitions of *function*, *dependent variable*, and *independent variable* in the context of the problem. This problem corresponds most directly to the work students did in Lesson 2: Guess My Rule and Lesson 4: Window Frames.

Suggested Next Steps: If students struggle . . .

- **Math Language Development** Consider using the mathematical language routine Critique, Correct, Clarify to help students understand and communicate how the terms *function*, *dependent variable*, and *independent variable* apply in the given context.
- Consider revisiting Lesson 2, Activity 1 or Lesson 4, Activity 2.

Problem 4

(Standards: **8.F.B.4, MP4**)

In this problem, students represent a function with an equation and to use the equation to solve problems. Students model with mathematics as they choose both their independent and dependent variables to model a situation in context. This problem corresponds most directly to the work students did in Lesson 4: Window Frames.

Suggested Next Steps: If students struggle . . .

- Consider asking students to identify relevant quantities in context, then ask which variable should act as the input.
- Consider revisiting Lesson 4, Activity 2, Screen 9.

Unit 8.5, Quiz 1: Summary and Rubric

Problem	Standard	Meeting/Exceeding	Approaching	Developing	Beginning	
		4	**3**	**2**	**1**	**0**
1	8.F.A.1	Correct choice. • $y = x - 12$			Incorrect choice. *Students who select $y = x^2$ may have mixed up the input and output.*	Did not attempt.
2	8.F.A.1	**All correct** choices and **no incorrect** choices. *Selects the correct three graphs.*	**One or two correct** choices and **no incorrect** choice. **All correct** choices and **one incorrect** choice.	**Two correct** choices but also includes **one incorrect** choice.	**Only incorrect** choices. **One correct** choice but also includes **one incorrect** choice.	Did not attempt.
3.1	8.F.A.1	**Correct answer** with **correct explanation**. • Yes *E.g., For each number of books, there is only one possible cost.* *The number of books he chooses to print determines the cost.* *The cost depends on the number of books.*	**Correct answer** with **minor flaws in explanation**. *E.g., Yes, because the more books he prints, the higher the total cost.* **Incorrect answer** with **logical and complete explanation**.	**Correct answer** with **incomplete explanation**. **Incorrect answer** with **explanation that shows partial understanding**.	**Incorrect answer** with **no or incorrect explanation**.	Did not attempt.

Unit 8.5, Quiz 1: Summary and Rubric

Problem	Standard	Meeting/Exceeding	Approaching	Developing	Beginning	
		4	**3**	**2**	**1**	**0**
3.2	8.F.A.1	**Correct answer** with **correct explanation.** • Yes *E.g., For each cost, there is only one possible number of books he can buy.* *The cost determines the number of books.* *The number of books he can print is dependent on the cost.*	**Correct answer** with **minor flaws in explanation.** *E.g., Yes, because the higher the total cost, the more books he will get.* **Incorrect answer** with **logical and complete explanation.**	**Correct answer** with **incomplete explanation.** **Incorrect answer** with **explanation that shows partial understanding.**	**Incorrect answer** with **no explanation or incorrect explanation.**	Did not attempt.
3.3	8.F.A.1	Correct answers. Independent variable: • Books printed (b) Dependent variable: • Total Cost (c)	Incomplete identification. *E.g.,* • *Independent variable: Books* • *Dependent variable: Cost*	One variable is correctly identified. Variables are swapped.	Work shows **limited understanding** of identifying the independent and dependent variables in a function. *E.g., Student does not mention books printed (b) or total cost (c) at all.*	Did not attempt.

Unit 8.5, Quiz 1: Summary and Rubric

Problem	Standard	Meeting/Exceeding	Approaching	Developing	Beginning	
		4	**3**	**2**	**1**	**0**
4.1	8.F.B.4	**Correct answers and explanations.** Independent variable: • Number of bus rides Dependent variable: • Total cost *E.g., Adriana's total cost depends on the number of rides that she takes.*	**Correct answer** with **minor flaws in explanation**. *E.g., The more bus rides Adriana takes, the more it will cost her.* **Incorrect answer** with **logical and complete explanation**. *E.g., Student swaps the description of the variables and writes an explanation that matches.*	**Correct answer** with **incomplete explanation**. **Incorrect answer** with **explanation that shows partial understanding**.	**Incorrect answer** with **no explanation or incorrect explanation**.	Did not attempt.
4.2	8.F.B.4	Correct answer based on equation from 4.1. • $y = 1.25x$	Work shows **conceptual understanding** with some errors. *E.g., Student swaps the variables, such as* $x = 1.25y$.	Work shows **incomplete understanding** with significant errors. *E.g., Student includes* 1.25, x, *and* y *in their equation.*	Work shows **limited understanding** of representing a function with an equation.	Did not attempt.

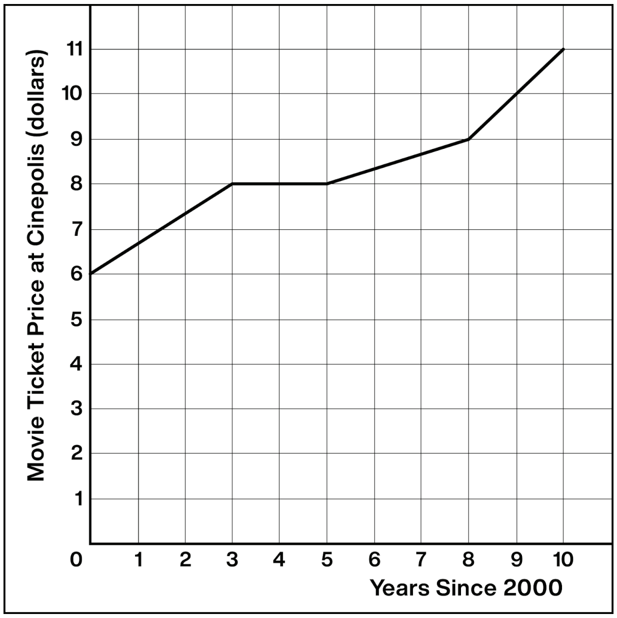
Unit 8.5, Quiz 1: Summary and Rubric

Problem	Standard	Meeting/Exceeding	Approaching	Developing	Beginning	
		4	**3**	**2**	**1**	**0**
4.3	8.F.B.4	**Correct answer**. • $\$12.50$	Work shows **conceptual understanding** with some errors. *E.g., Student uses incorrect equation from 4.2 correctly by substituting 5 days and 10 bus trips into their equation.*	Work shows **incomplete understanding** with significant errors. *E.g., Student only substitutes either 5 days or 10 bus trips into their equation.*	Work shows **limited understanding** of using an equation to solve problems. *E.g., Student does not substitute 5 days or 10 bus trips into their equation.*	Did not attempt.

Unit 8.5, Quiz 2: Lessons 5–9 Name ______________________

1. Two movie theaters, Star Theater and Cinepolis, opened in 2000. The price of a movie ticket at each theater changed over time.

Years Since 2000	Movie Ticket Price at Star Theater (dollars)
0	\$6.75
2	\$7.75
5	\$8.25
8	\$10.00
10	\$11.50



Which statement is true?

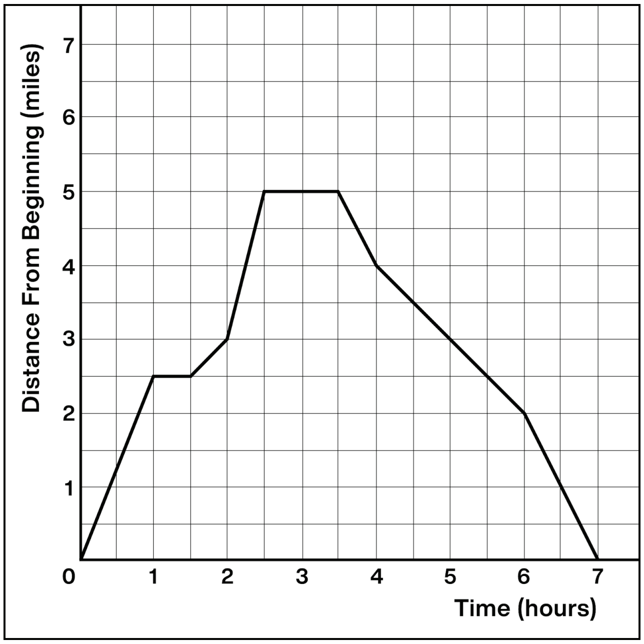
A. In 2000, the movie ticket price was higher at Cinepolis than at Star Theater.
B. In 2010, the price of a movie ticket was the same at both theaters.
C. Between 2000 and 2002, the ticket price at Star Theater increased by $\$1$ per year.
D. Between 2008 and 2010, the ticket price increased more at Cinepolis than at Star Theater.

2. Consider the following situation:

55 people got on an empty bus. After 30 minutes, 40 of them got off the bus. After 15 more minutes, the rest of the passengers got off the bus.

Sketch a graph that represents this situation. Label the axes with independent and dependent variables.

3. Joel went on a long hike. The graph below represents his journey.



Select **all** of the statements that are true.

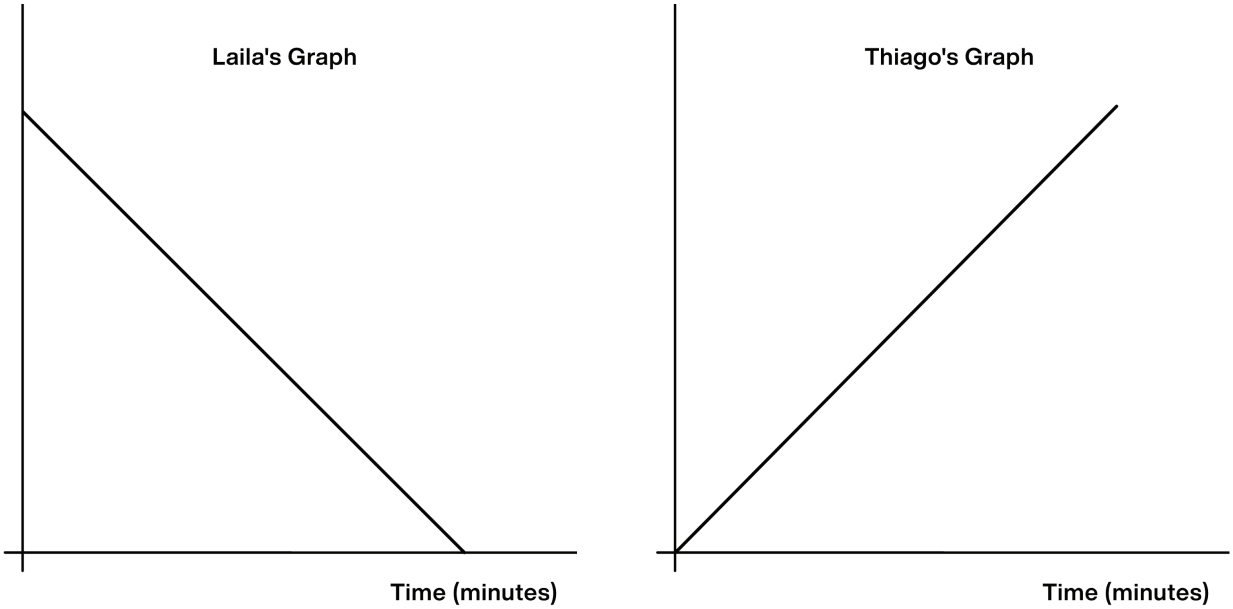
- ☐ Joel's distance is a function of time.
- ☐ Joel's fastest speed occurs in the first hour of the hike.
- ☐ After 5 hours, Joel had hiked 3 miles.
- ☐ Joel hiked a total of 10 miles.
- ☐ The graph is decreasing at all times between 3.5 hours and 7 hours.

4. A small company is selling a new board game, and they need to know how many to produce in the future. They sold a total of 400 games after 11 months, 800 games after 21 months, and 1500 games after 36 months.

Is a single linear model a reasonable option for this data? If so, use the model to estimate the number of games sold after 48 months. If not, explain your reasoning.

Unit 8.5, Quiz 2: Lessons 5–9 Name ___________________________

5. While watching a movie, Laila and Thiago shared a bag of popcorn and ate it at a steady rate. They each sketched a graph to represent the situation.



5.1 Label each graph's vertical axis so that both graphs accurately represent the situation.

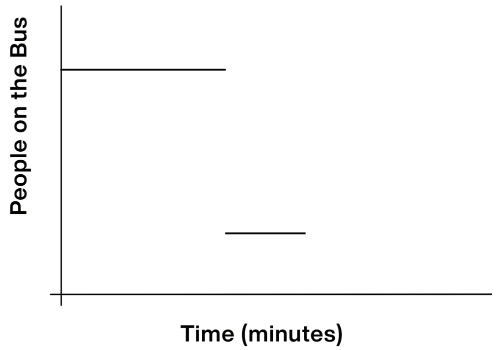
5.2 Write your own equation in the form $y = mx + b$ that could represent Laila's graph. Explain what each number in your equation means in terms of the situation.

5.3 What is one advantage of your equation over the graph?

Answer Key

1. D. Between 2008 and 2010, the ticket price increased more at Cinepolis than at Star Theater.

2.

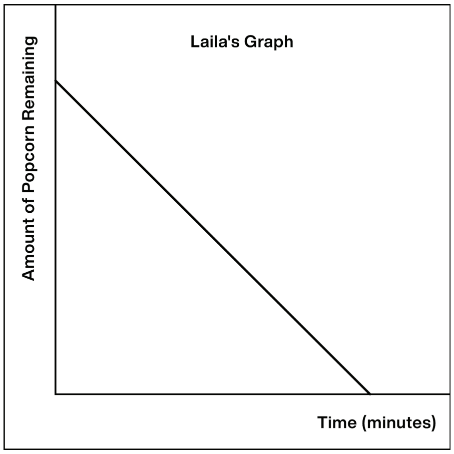


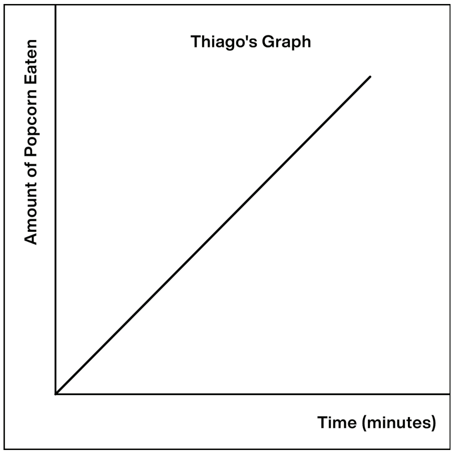
Responses vary. See graph. Note that any correct response should have two horizontal segments. Some students may add a third segment on the horizontal axis. Others will connect the endpoints to indicate that not everyone instantly leaves the bus, and some may have short line segments in a staircase to indicate that people leave the bus one at a time.

3. ✓ Joel's distance is a function of time.
   ✓ Joel hiked a total of 10 miles.
   ✓ The graph is decreasing at all times between 3.5 hours and 7 hours.

4. Yes. *Responses vary.* After 48 months there should be between 1900 and 2100 sales depending on the data points used for the model.

5.1 *Responses vary.*





5.2 *Responses vary.* $y = -5x + 200$. The 200 represents the amount of popcorn in the bag at the beginning of the movie. -5 signifies that the popcorn was eaten at 5 pieces per minute.

5.3 *Responses vary.* While the graph is useful for seeing the general trends, the equation provides specific numbers that give information about the situation, such as the initial amount and the rate of change.

Unit 8.5, Quiz 2: Summary and Rubric

Content Standards Summary

Standard	8.F.A.2	8.F.A.3	8.F.B.4	8.F.B.5
Problems	1	4	4, 5	2, 3

Problem 1

(Standards: **8.F.A.2, MP2**)

In this problem, students compare inputs and outputs of functions that are represented in different ways. Students reason abstractly and quantitatively when they compare different data displays and determine a measurement (slope) to compare between the two. This problem corresponds most directly to the work students did in Lesson 7: Feel the Burn.

Suggested Next Steps: If students struggle . . .

- Consider asking students how a rate of change expresses itself in both a graph and a table, then have students determine and compare relevant rates of change.
- Consider revisiting Lesson 7, Activity 1, Cards 1 or 2.

Problem 2

(Standards: **8.F.B.5, MP4**)

In this problem, students draw the graph of a function that represents a context. Students model with mathematics as they determine and graph the relationship between independent and dependent variables in context. This problem corresponds most directly to the work students did in Lesson 6: Graphing Stories.

Suggested Next Steps: If students struggle . . .

- Consider asking students to first identify important points they should include on their graph, such as representing the beginning, middle, and end of the story.
- Consider revisiting Lesson 6, Activity 1.

Unit 8.5, Quiz 2: Summary and Rubric

Problem 3

(Standards: **8.F.B.5, MP7**)

In this problem, students interpret the graph of a function in context. Students make use of the graph to determine what happened in the given situation. This problem corresponds most directly to the work students did in Lesson 5: The Tortoise and the Hare.

Suggested Next Steps: If students struggle . . .

- Consider asking students to label the points that divide the function into sections, then ask students to use their ordered pairs to form a narrative for each section.
- Consider revisiting Lesson 5, Activity 1.

Problem 4

(Standards: **8.F.A.3, 8.F.B.4, MP2**)

In this problem, students reason abstractly and quantitatively to decide whether or not it is reasonable to model a relationship with a linear function. This problem corresponds most directly to the work students did in Lesson 8: Charge!

Suggested Next Steps: If students struggle . . .

- Consider having students organize the given data into a table, or graph them as ordered pairs. If more help is needed, have students determine the slope between each pair of points in their display.
- Consider revisiting Lesson 8, Activity 1.

Problem 5

(Standards: **8.F.B.4, MP6**)

In this problem, students construct a function to model a linear relationship between two quantities. Students attend to precision when they appropriately label axes given a graph and context.
This problem corresponds most directly to the work students did in Lesson 9: Piecing It Together.

Suggested Next Steps: If students struggle . . .

- Consider asking students why one graph is sloped upward and one is sloped downward, then ask how they could label the graphs so that these slopes make sense.
- Consider revisiting Lesson 9, Activity 2.

Unit 8.5, Quiz 2: Summary and Rubric

Problem	Standard	Meeting/Exceeding	Approaching	Developing	Beginning	
		4	**3**	**2**	**1**	**0**
1	8.F.A.2	Correct choice. • Between 2008 and 2010, the ticket price increased more at Cinepolis than at Star Theater.			Incorrect choice. *Students who selected "Between 2000 and 2002, the ticket price at Star Theater increased by* $1 *per year" may have estimated the rate of change.*	Did not attempt.
2	8.F.B.5	Work is **complete and correct**. Independent variable: • Time Dependent variable: • People on the bus *E.g., Any correct response should have two horizontal segments. Some students may add a third segment on the horizontal axis. Others will connect the endpoints to indicate that not everyone instantly leaves the bus, and some may have short line segments in a staircase to indicate that people leave the bus one at a time.*	Work shows **conceptual understanding** with some errors. *E.g., The length and placement of the horizontal segments are mostly accurate.*	Work shows **incomplete understanding** with significant errors. *E.g., Sketch is mostly accurate but the variables are not labeled.*	Work shows **limited understanding** of drawing the graph of a function that represents a context. *Students who sketch negative slope segments may have understood there was a decrease in passengers.*	Did not attempt.

Unit 8.5, Quiz 2: Summary and Rubric

Problem	Standard	Meeting/Exceeding	Approaching	Developing	Beginning	
		4	3	2	1	0
3	8.F.B.5	**All correct** choices and **no incorrect** choices. • Joel's distance is a function of time. • Joel hiked a total of 10 miles. • The graph is decreasing at all times between 3.5 hours and 7 hours.	**One or two correct** choices and **no incorrect** choice. **All correct** choices and **one incorrect** choice.	**One or two correct** choices but also includes **two incorrect** choices.	**Only incorrect** choices. **Two incorrect** choices with some correct choices.	Did not attempt.
4	8.F.A.3, 8.F.B.4	**Correct answer** with **correct explanation.** • Yes *E.g., After 48 months, there should be between 1900 and 2100 sales depending on the data points used for the model.*	**Correct answer** with **minor flaws in explanation.** **Incorrect answer** with **logical and complete explanation.**	**Correct answer** with **incomplete explanation.** **Incorrect answer** with **explanation that shows partial understanding.**	**Incorrect answer** with **no explanation** or **incorrect explanation.**	Did not attempt.
5.1	8.F.B.4	Both labels are correct. *E.g.,* • **Left graph**: Amount of Popcorn Remaining • **Right graph**: Amount of Popcorn Eaten	Work shows **conceptual understanding** with some errors. *E.g., Both graph's labels make sense but do not reference the popcorn.*	Work shows **incomplete understanding** with significant errors. *E.g., One graph's label represents the situation.*	Work shows **limited understanding** of labeling axes given a graph and context. *E.g., Both graph's labels do not make sense.*	Did not attempt.

Unit 8.5, Quiz 2: Summary and Rubric

Problem	Standard	Meeting/Exceeding	Approaching	Developing	Beginning	
		4	**3**	**2**	**1**	**0**
5.2	8.F.B.4	**Correct answer** with **correct explanation** that matches labels from 5.1. • $y = -5x + 200$ (any equation with a negative slope and positive y-intercept) *E.g., The* 200 *represents the amount of popcorn in the bag at the beginning of the movie.* -5 *signifies that the popcorn was eaten at* 5 *pieces per minute.*	**Correct answer** with **minor flaws in explanation**. *E.g., The popcorn starts at* 200 *and decreases by* 5. **Incorrect answer** with **logical and complete explanation**. *E.g., Student's equation has a correct slope and incorrect* y-intercept *with a correct interpretation.*	**Correct answer** with **incomplete explanation**. *E.g., The popcorn decreases by* 5. **Incorrect answer** with **explanation that shows partial understanding**.	**Incorrect answer** with **no explanation** or **incorrect explanation**.	Did not attempt.
5.3	8.F.B.4	Correct description. *E.g., While the graph is useful for seeing the general trends, the equation provides specific numbers that give information about the situation, such as the initial amount and the rate of change.*	Work shows **conceptual understanding** with some errors. *E.g., Student references an advantage that both representations share such as, "You can tell the popcorn decreases in both the graph and equation."*	Work shows **incomplete understanding** with significant errors. *E.g., Student references initial amount or rate of change inaccurately.*	Work shows **limited understanding** of describing the similarities and differences between an equation and graphical representation.	Did not attempt.

1. This table shows a linear relationship between the amount of water in a container and time.

   Which of these statements is true?

   The water in the container is:

   A. Increasing at 2 gallons per minute.

   B. Increasing at 10 gallons per minute.

   C. Decreasing at 2 gallons per minute.

   D. Decreasing at 10 gallons per minute.

Time (min.)	Water (gal.)
0	30
5	20
10	10

2. A cylinder has a volume of 78 cm^3.

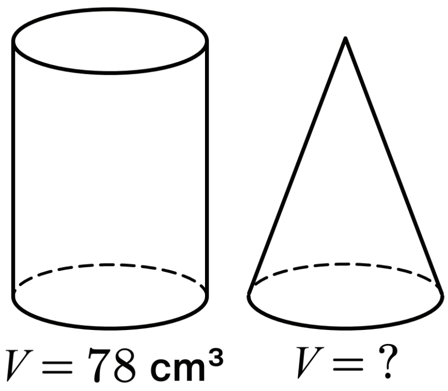
   What is the volume of a **cone** with the same radius and height?

   A. 26 cm^3

   B. 39 cm^3

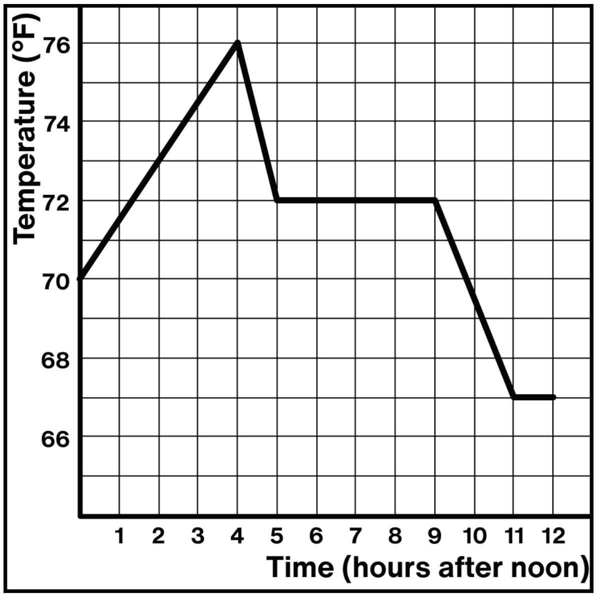
   C. 156 cm^3

   D. 234 cm^3



3. This graph shows the temperature in Mariam's house between noon and midnight one day.

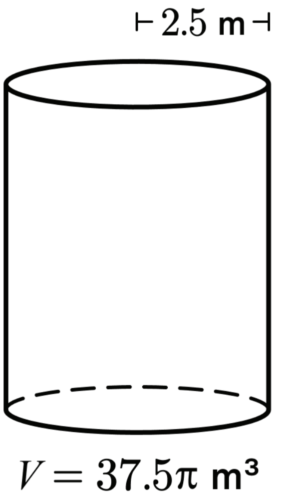
Select **all** of the true statements.



- ☐ Time is a function of temperature.
- ☐ The lowest temperature occurred between 4:00 and 5:00.
- ☐ The temperature was increasing between 9:00 and 10:00.
- ☐ The temperature was $74°$ twice during this time.
- ☐ There was a four-hour period during which the temperature did not change.

4. A cylinder has a radius of 2.5 meters. Its volume is 37.5π cubic meters.

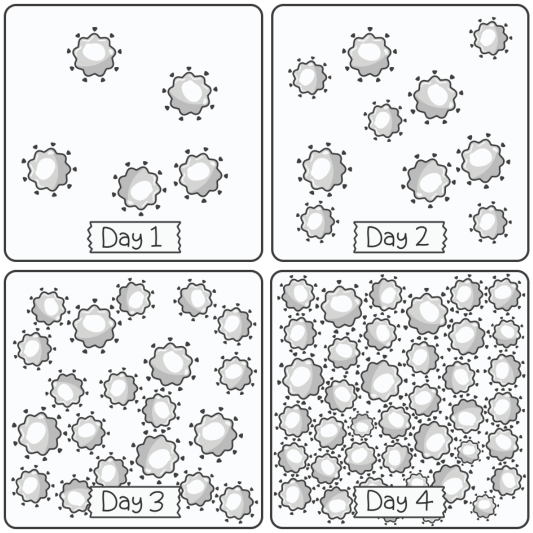
What is the height of the cylinder?



Unit 8.5, End-Unit Assessment: Form A Name ________________________________

Lucia counts 5 bacteria under a microscope.

She counts them again each day for 4 days and notices that the number of bacteria doubles each day.



5.1 Is the population of bacteria a function of the number of days?
Explain your thinking.

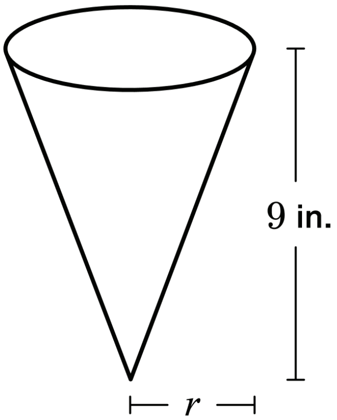
5.2 Is there a linear relationship between the number of days and the number of bacteria?
Explain your thinking.

Each row of the table below represents a cone with a height of 9 inches and a different radius.

6.1 Calculate the volume of each cone.

Write your answer in terms of π or rounded to the nearest cubic inch.

Radius (in.)	**Volume (cubic in.)**
1	
2	
3	

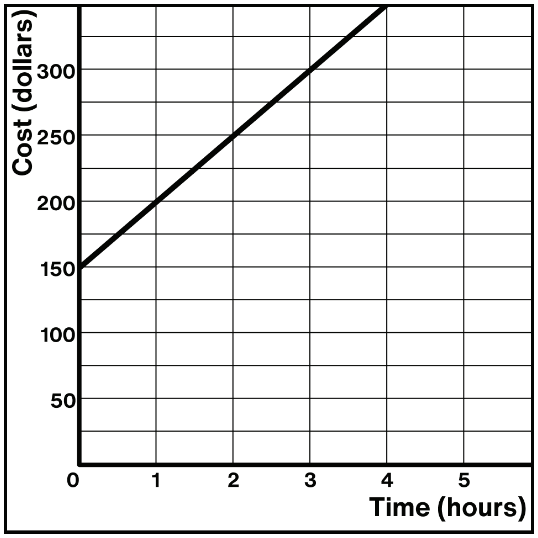


6.2 Is there a linear relationship between the radius and the volume of these cones?
Explain your thinking.

Unit 8.5, End-Unit Assessment: Form A Name ________________________________

Two plumbing companies charge for each hour of work, plus a one-time fee.

Quality Plumbing charges according to this graph.



A-Plus Plumbing charges according to this table.

Time (hours)	Cost (dollars)
1	140
4	320
6	440

7.1 How much does Quality Plumbing charge for each hour?

What is the one-time fee?

Explain or show your thinking.

7.2 How much does A-Plus Plumbing charge for each hour?

What is the one-time fee?

Explain or show your thinking.

7.3 Is the cost of using Quality Plumbing or A-Plus Plumbing ever the same for the same amount of time?

Explain or show your thinking.

Unit 8.5, End-Unit Assessment: Form A Name ____________________

Reflection: Select a question to answer.

- ☐ What is something you are proud of from this unit?

- ☐ Write what you know about a topic from this unit that you weren't asked about today.

- ☐ Describe or show one strategy you found helpful in this unit.
  Name any students who helped you with this strategy.

- ☐ What else would you like your teacher to know?

Unit 8.5, End-Unit Assessment: Form A

Answer Key

1. C. Decreasing at 2 gallons per minute.

2. A. 26 cm^3

3. ✓ The temperature was $74°$ twice during this time.
   ✓ There was a four-hour period during which the temperature did not change.

4. 6 meters

5.1 Yes.
Explanations vary. It is a function because there is a single output (the number of bacteria) for each input (the number of days).

5.2 No.
Explanations vary. It is not a linear relationship because the rate of change does not stay the same.

6.1

Radius (in.)	Volume (cubic in.)
1	3π or 9
2	12π or 38
3	27π or 85

6.2 No.
Explanations vary. The three points in the table would not be on a line because the slope between the pairs of points is not the same.

7.1 The cost for each hour of work is $\$50$.

The one-time fee is $\$150$.

Explanations vary. To determine the cost per hour, I looked at the slope of the line, which is 50. To determine the one-time fee, I looked at the y-intercept of the graph.

7.2 The cost for each hour of work is $\$60$.

The one-time fee is $\$80$.

To determine the cost per hour, find the rate of change: $\frac{440-140}{5}$. To determine the one-time fee, subtract $\$60$ from $\$140$.

7.3 Yes. *Responses vary.* A-Plus Plumbing has a lower one-time fee but costs more per hour, so it will eventually catch up to Quality Plumbing.

Unit 8.5, End Assessment Summary and Rubric: Form A

Content Standards Summary

Standard	8.F.A.1	8.F.A.2	8.F.A.3	8.F.B.4	8.F.B.5	8.G.C.9
Problems	5.1	7.3	6.2	1, 7.1, 7.2	3, 5.2	2, 4, 6.1

Problem 1

(Standards: **8.F.B.4, MP2**)

In this problem, students reason abstractly and quantitatively to determine the rate of change of a linear relationship in context from a table. This problem corresponds most directly to the work students did in Lesson 7: Feel the Burn and Lesson 8: Charge.

Suggested Next Steps: If students struggle . . .

- Consider asking students to find the rate of change between each consecutive set of points in the table.
- Consider revisiting Lesson 7, Activity 1 or Lesson 8, Activity 1.

Problem 2

(Standard: **8.G.C.9**)

In this problem, students recognize the relationship between the volume of a cylinder and the volume of a cone. This problem corresponds most directly to the work students did in Lesson 13: Cones.

Suggested Next Steps: If students struggle . . .

- Consider asking students to write down the formulas for the volume of both a cylinder and a cone. Then ask them to identify similarities and differences between the formulas.
- Consider revisiting Lesson 13, Activity 1, Screen 5.

Unit 8.5, End Assessment Summary and Rubric: Form A

Problem 3

(Standards: **8.F.B.5, MP7**)

In this problem, students interpret the graph of a functional relationship. Students make use of the graph structure to determine what happened in the given situation. This problem corresponds most directly to the work students did in Lesson 5: The Tortoise and the Hare.

Suggested Next Steps: If students struggle . . .

- Consider asking students to label the points that divide the function into sections, then ask students to use their ordered pairs to form a narrative for each section.
- Consider revisiting Lesson 5, Activity 1, Screen 5.

Problem 4

(Standard: **8.G.C.9**)

In this problem, students calculate the height of a cylinder given its volume. This problem corresponds most directly to the work students did in Lesson 14: Missing Dimensions.

Suggested Next Steps: If students struggle . . .

- Consider asking students to write down the formula for the volume of a cylinder, then substitute the given information into the formula to form an equation they can solve.
- Consider revisiting Lesson 14, Activity 1. Choose one row to discuss as a class — the second row is the most similar to the assessment question.

Problem 5
(Standards: **8.F.A.1, 8.F.B.5, MP6**)

In this problem, students determine whether or not a relationship is a function and/or linear. Students attend to precision as they apply the definitions of *function* and *linear* to the problem context. This problem corresponds most directly to the work students did in Lesson 3: Function or Not? and Lesson 8: Charge.

Suggested Next Steps: If students struggle . . .
- Consider having students organize the data in a table or graph, then determine the rate of change between each set of points.
- Consider revisiting Lesson 3, Activity 1 or Lesson 8, Activity 1.

Problem 6
(Standards: **8.G.C.9, 8.F.B.3**)

In this problem, students calculate the volume of cones and demonstrate their understanding of linear relationships. This problem corresponds most directly to the work students did in Lesson 12: Scaling Cylinders and Lesson 13: Cones.

Suggested Next Steps: If students struggle . . .
- Consider reminding students of the relationship between the volumes of a cone and cylinder with the same height and radius.
- Consider revisiting Lesson 13, Activity 2, Screen 7.

Problem 7
(Standards: **8.F.B.4, 8.F.A.2, MP2**)

In this problem, students determine the initial value and rate of change of linear relationships in context. Students reason abstractly and quantitatively when they compare and contrast the two scenarios. This problem corresponds most directly to the work students did in Lesson 7: Feel the Burn.

Suggested Next Steps: If students struggle . . .
- Consider asking students to write equations to represent each scenario. Have students work backward to determine the cost at time 0, then ask how the corresponding y-value should be expressed in the equation.
- Consider revisiting Lesson 7, Activity 1.

Unit 8.5, End Assessment Summary and Rubric: Form A

Problem	Standard	Meeting/Exceeding	Approaching	Developing	Beginning	
		4	3	2	1	0
1	8.F.B.4, MP2	• Decreasing at 2 gallons per minute.			Students who select "Increasing at a rate of 2 gallons per minute" may have calculated the correct rate but interpreted it incorrectly as an increase. Students who select "Decreasing at a rate of 10 gallons per minute" may have correctly interpreted the change between rows but not the rate of change.	Did not attempt.
2	8.G.C.9	• 26 cm^3			Students who select 234 cm^3 may have multiplied by 3 instead of dividing. Students who select 39 cm^3 may have confused the volume formula with the triangle area and divided by 2 instead of by 3.	Did not attempt.
3	8.F.B.5, MP7	Student selects all of the correct choices and does not select any incorrect choices. • The temperature was 74° twice during this time. • There was a four-hour period during which the temperature did not change.	Student selects one of the correct choices and does not select any incorrect choices. Student selects both of the correct choices and one incorrect choice.	Student selects one of the correct choices and one incorrect choice.	Student only selects incorrect choices. Student selects two or more incorrect choices with the correct choices.	Did not attempt.

Unit 8.5, End Assessment Summary and Rubric: Form A

Problem	Standard	Meeting/Exceeding	Approaching	Developing	Beginning	
		4	**3**	**2**	**1**	**0**
4	8.G.C.9	Work is complete and correct. • 6 meters	Work shows conceptual understanding and mastery, with minor errors. • Students who write 1.9 may have calculated $(2.5\pi)^2$ as the area of the base. • Students who write 0.17 meters may have divided $\pi \cdot 2.5^2$ by 37.5π instead of the other way around. • Students who write 15 meters may have used 2.5π as the area of the base.	Work shows a developing but incomplete conceptual understanding, with significant errors. • Students who write 736.31 meters may have calculated $\pi\,(2.5)^2\,37.5$.	Weak evidence of understanding.	Did not attempt.
5.1	8.F.A.1, MP6	Student successfully answers the question and includes a logical and complete explanation. • Yes. There is a single output for each input.	Correct answer with minor flaws in explanation. Incorrect answer with logical and complete explanation.	Correct answer with incomplete explanation. Incorrect answer with explanation that communicates partial understanding of the situation.	Incorrect answer with incorrect explanation or without an explanation.	Did not attempt.

Unit 8.5, End Assessment Summary and Rubric: Form A

Problem	Standard	Meeting/Exceeding	Approaching	Developing	Beginning	
		4	3	2	1	0
5.2	8.F.B.5, MP6	Student successfully answers the question and includes a logical and complete explanation. • No. It is not a linear function because the rate of change does not stay the same.	Correct answer with minor flaws in explanation. Incorrect answer with logical and complete explanation.	Correct answer with incomplete explanation. Incorrect answer with explanation that communicates partial understanding of the situation.	Incorrect answer with incorrect explanation or without an explanation.	Did not attempt.
6.1	8.G.C.9	Work is complete and correct. • 3π or 9 or 9.42 • 12π or 38 or 37.7 • 27π or 85 or 84.82	Student correctly completes the table for two of the three rows. Student does not divide by 3 when calculating the volume of the cone. • 9π or 28 • 36π or 113 • 81π or 254	Work shows a developing but incomplete conceptual understanding, with significant errors. Student correctly completes the table for one of the three values.	Weak evidence of understanding.	Did not attempt.
6.2	8.F.B.3 Score this question using the student's table.	Student successfully answers the question and includes a logical and complete explanation. • No. It is not a linear function because the rate of change does not stay the same.	Correct answer with minor flaws in explanation. Incorrect answer with logical and complete explanation.	Correct answer with incomplete explanation. Incorrect answer with explanation that communicates partial understanding of the situation.	Incorrect answer with incorrect explanation or without an explanation.	Did not attempt.

Unit 8.5, End Assessment Summary and Rubric: Form A

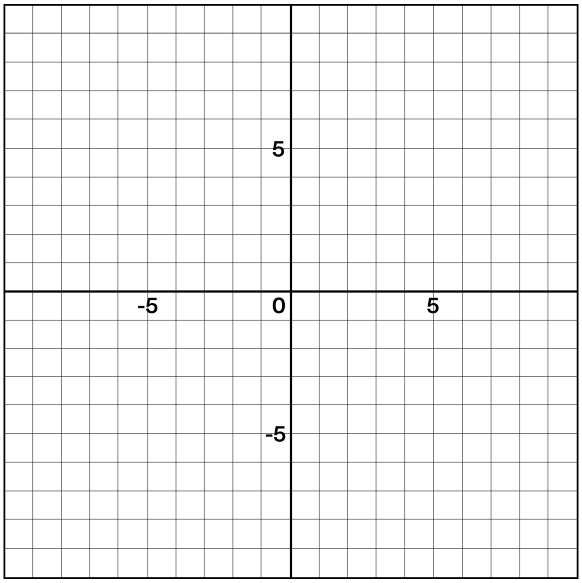
Problem	Standard	Meeting/Exceeding	Approaching	Developing	Beginning	
		4	3	2	1	0
7.1	8.F.B.4, MP2	Student successfully answers the question and includes a logical and complete explanation. • 50 dollars 150 dollars To determine the cost per hour, I looked at the slope of the line, which is 50. To determine the one-time fee, I looked at the y-intercept of the graph.	Correct answer with minor flaws in explanation. Partially correct answer with logical and complete explanation.	Correct answer with incomplete explanation. Partially correct answer with explanation that communicates partial understanding of the situation.	Incorrect answer with incorrect explanation or without an explanation.	Did not attempt.
7.2	8.F.B.4, MP2	Student successfully answers the question and includes a logical and complete explanation. • 60 dollars 80 dollars To determine the cost per hour, find the rate of change: $\frac{440-140}{5} = 60$. To determine the one-time fee, subtract $\$60$ from $\$140$.	Correct answer with minor flaws in explanation. Partially correct answer with logical and complete explanation.	Correct answer with incomplete explanation. Partially correct answer with explanation that communicates partial understanding of the situation.	Incorrect answer with incorrect explanation or without an explanation.	Did not attempt.

Unit 8.5, End Assessment Summary and Rubric: Form A

Problem	Standard	Meeting/Exceeding	Approaching	Developing	Beginning	
		4	3	2	1	0
7.3	8.F.A.2, MP2	Student successfully answers the question and includes a logical and complete explanation. • Yes. A-Plus Plumbing has a lower one-time fee but costs more per hour, so it will eventually catch up to Quality Plumbing.	Correct answer with minor flaws in explanation. Incorrect answer with logical and complete explanation.	Correct answer with incomplete explanation. Incorrect answer with explanation that communicates partial understanding of the situation.	Incorrect answer with incorrect explanation or without an explanation.	Did not attempt.

Unit 8.6, Readiness Check Name ______________________________

1. A line contains the points $(-3, -2)$ and $(7, 2)$.
Use the coordinate plane if it helps you with your thinking.



1.1 Is the slope of this line positive or negative.

Explain your thinking.

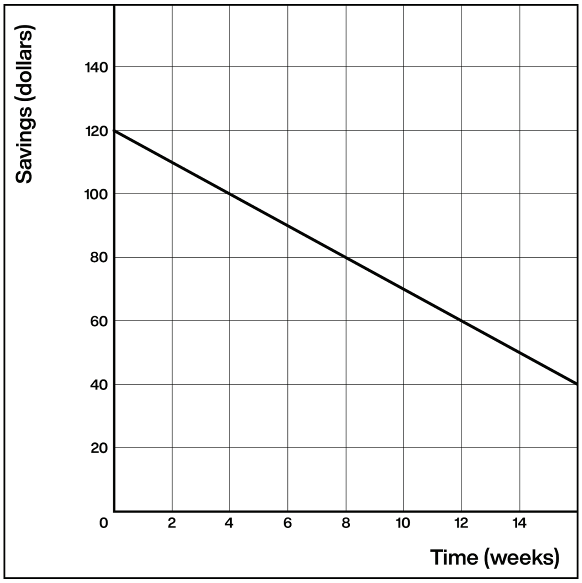
1.2 Calculate the slope of the line.

2. Mio deposits money in his bank account from a summer job and doesn't spend any of it.

- After working 3 hours total, he has $\$71$.
- After working 12 hours total, he has $\$134$.

How much money does Mio earn per hour?

3. Here is a graph showing the amount in someone's savings account since the beginning of the year.



3.1 Write an equation for the line shown on the graph.

3.2 What does the slope mean in the situation?

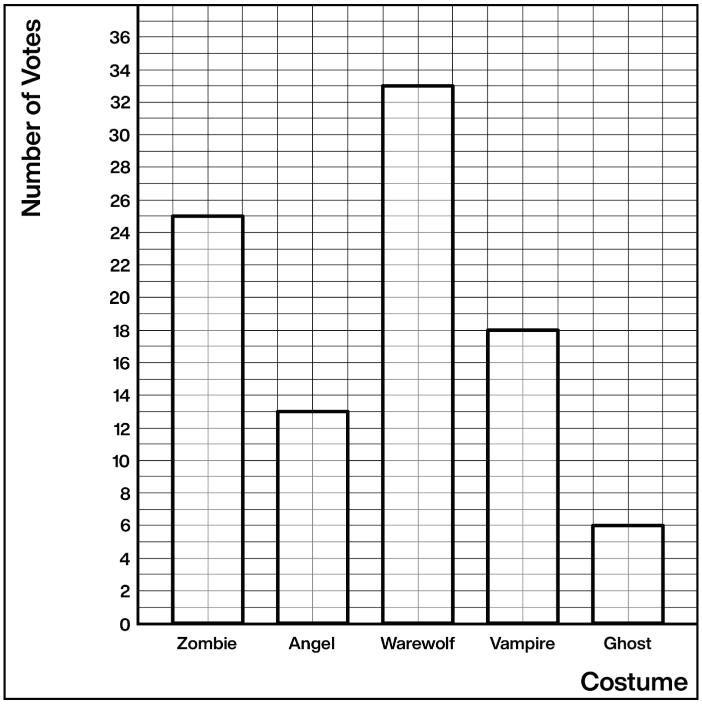
3.3 What does the vertical intercept mean in the situation?

Unit 8.6, Readiness Check Name ______________________________

4. In many schools, students have the choice between taking art, music, or some other elective.

4.1 At Euclid Middle School, there are 200 students in the 8th grade. 40 students are taking art. What percentage of 8th graders at Euclid Middle School are taking art? Explain or show your thinking.	4.2 At Newton Middle School, there are 320 students in the 8th grade. 54 are taking music. What percentage of 8th graders at Newton Middle School are taking music? Explain or show your thinking.

5. Students voted for their favorite entry in a Halloween costume contest.



5.1 Which costume got more votes: The angel or the zombie?

5.2 How many votes did the vampire get?

5.3 Who won the contest?

Name ______________________________

6. Students at Kanna's school were polled about the animal they would most like to have as a pet.

Animal	**Votes**
Bird	22
Cat	45
Dog	55
Fish	37
Rabbit	15

Make a bar graph that displays this information.

Answer Key

1.1 The slope is positive. One way to see this is to plot the two points. Another is to note that as the x-coordinate increases, the y-coordinate also increases.

1.2 $\frac{2}{5}$ (or equivalent)

2. $\$7$ per hour

3.1 $y = -5x + 120$ (or equivalent)

3.2 The slope of -5 means this person is spending $\$5$ per week.

3.3 The vertical intercept of 120 means this person started with $\$120$ in the account.

4.1 20%. *Explanations vary.* One strategy is to notice that $40 : 200$ and $20 : 100$ are equivalent ratios, so 20% of 8th graders at Euclid Middle School are taking art.

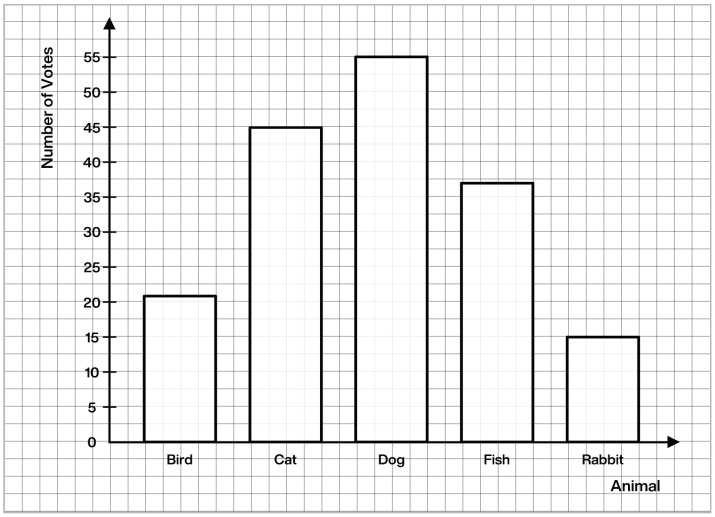
4.2 16.875%. *Explanations vary.* Since there are 54 students taking music out of a total of 320 students in 8th grade, the proportion of 8th grade students taking music can be represented by the fraction $\frac{54}{320}$. This can be found as a percentage by dividing 54 by 320 and multiplying by 100.

5.1 Zombie

5.2 18 votes

5.3 Werewolf

6.



Unit 8.6, Readiness Check Summary

For teachers who choose to spread out the questions, consider assigning the following:

- Problems 1, 2, and 3 before Lesson 5
- Problems 4 and 5 before Lesson 9
- Problem 6 before Lesson 11

Problem 1

(Standard: **8.F.B.4**)

This problem is intended to surface what students already know about the slope of a line given two points on a coordinate plane. In this unit, students will need to visually inspect the data in scatter plots to determine if the data points show a positive association, a negative association, or neither. This content first appears in Lesson 6: Interpreting Slopes.

Suggested Next Steps: If students struggle . . .

- Plan to reinforce language about positive and negative slopes, specifically "as the value of one variable increases, the value of the other increases" for positive slope, and "as the value of one variable increases, the value of the other decreases" for negative slope.

Problem 2

(Standard: **6.RP.A.3.B**)

This problem is intended to surface what students already know about calculating a rate from context. Although this problem does not use the word “slope,” students need to determine the rate of change. This content first appears in Lesson 6: Interpreting Slopes.

Suggested Next Steps: If students struggle . . .

- Plan to revisit this question during Activity 1 of Lesson 6.

Problem 3

(Standards: **8.EE.B.6, 8.F.B.4, MP2**)

This problem is intended to surface what students already know about linear equations and how they relate to the context that they represent. Students reason abstractly and quantitatively when interpreting the information in the graph to answer the questions. In this unit, students will draw lines that fit data in a scatter plot and estimate the slope, intercept, and equation for the line they drew. This content first appears in Lesson 8: Animal Brains.

Suggested Next Steps: If students struggle . . .

- Consider reviewing how to determine a slope from a graph in Lesson 4. In Lessons 5, 6, and 7, continue to invite students to show how the slope and intercepts of a linear model can be seen in the equation and in the graph. When students draw lines of fit, give them opportunities to practice estimating slope and intercepts using graphs.

Problem 4

(Standard: **6.RP.A.3.C**)

This problem is intended to surface what students already know about calculating percentages from a context. In this unit, students will be introduced to two-way tables. Many questions that come up in the context of two-way tables are of the form "What percentage of _____ are _____?" This content first appears in Lesson 10: Finding Associations.

Suggested Next Steps: If students struggle . . .

- Plan to spend extra time on Screen 4 of Lesson 10 discussing how to calculate the percentage of each group that did and did not survive the Titanic.

Problem 5

(Standard: **2.MD.D.10**)

This problem is intended to surface what students already know about how to interpret information presented in a bar graph. Bar graphs should be familiar to students from grade school, but it has been a long time since students have used this representation. In this unit, students will learn to use segmented bar graphs as a way of representing categorical data. This content first appears in Lesson 9: Tasty Fruit.

Suggested Next Steps: If students struggle . . .

- Plan to spend extra time in Activity 2 of Lesson 9. It may be helpful to invite students to make connections between the two-way tables and the bar graphs during the lesson synthesis.

Problem 6

(Standard: **3.MD.B.3, MP6**)

This problem is intended to surface what students already know about how to construct a bar graph given a set of data. Students attend to precisions when they consider how many bars are needed and how to scale the vertical axis. This content first appears in Lesson 11: Federal Budgets.

Suggested Next Steps: If students struggle . . .

- Plan to review this question before Lesson 11. Consider offering individual support throughout the lesson as students create bar graphs for their posters.

Unit 8.6, End-Unit Assessment: Form A

Name ______________________________

1. Here is a scatter plot.

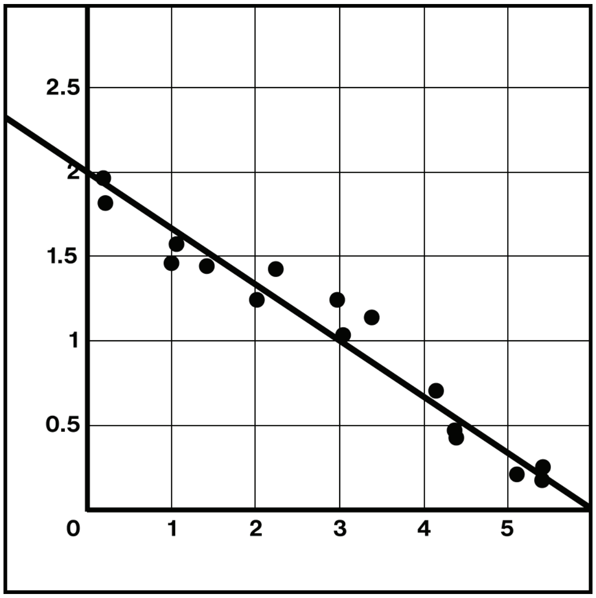
   Which equation fits this data?

   A. $y = -\frac{1}{3}x + 2$

   B. $y = \frac{1}{3}x + 2$

   C. $y = -\frac{1}{3}x + 6$

   D. $y = \frac{1}{3}x + 6$



2. Tariq gathered data to see if there was an association between grade level and handedness.

   The number of right-handed 8th graders is missing from the table.

   Tariq found **no association**. About how many right-handed 8th graders must there be?

   A. 33

   B. 85

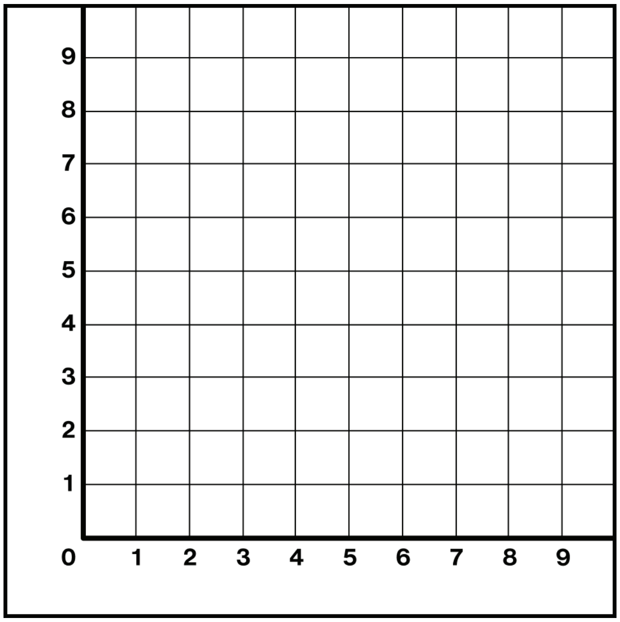
   C. 107

   D. 157

	Left-Handed	Right-Handed
7th Grade	11	72
8th Grade	24	?

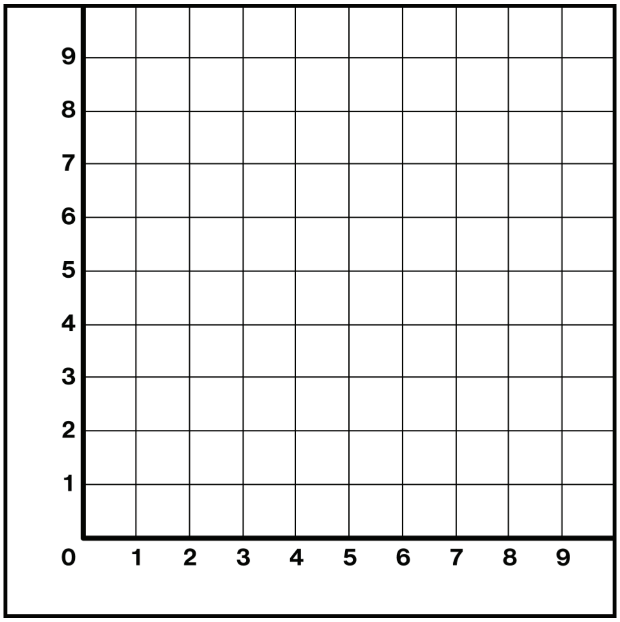
3.1 Draw a scatter plot that includes:

- At least six points.
- A **positive linear** association.
- One obvious outlier.



3.2 Draw a scatter plot that includes:

- At least six points.
- A **negative, nonlinear** association.



4. Select **all** the pairs of variables that have a **positive** association

- ☐ A: Outside temperature
  B: Cost to heat a home
- ☐ A: Number of people in a checkout line
  B: Time you have to wait to check out
- ☐ A: Minutes you have walked
  B: Number of steps you've walked
- ☐ A: Pounds of cherries you buy
  B: Total cost of the cherries
- ☐ A: Speed of a train
  B: Time for the train to get to its destination

5. Diamond surveyed all 7th and 8th graders at her school about whether they have pets.

Complete this two-way table

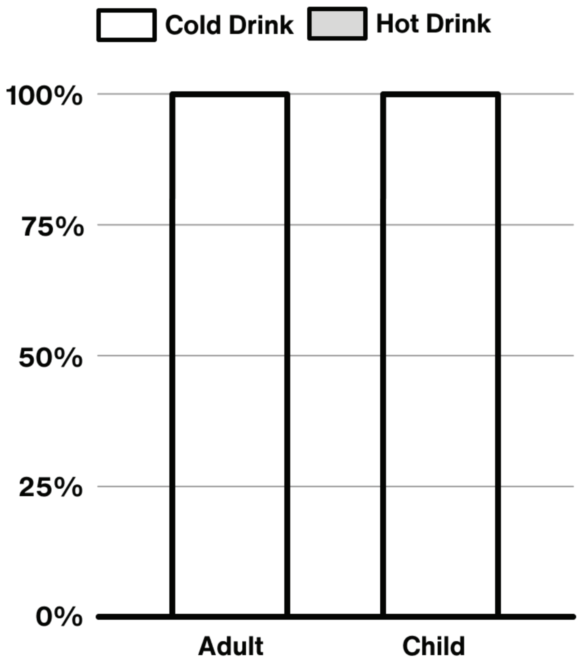
	Have Pet	**Have No Pet**	**Total**
7th Grade	102		150
8th Grade		68	175
Total			

6.1 This relative frequency table shows the percentage of adults and children who prefer cold drinks or hot drinks.

	Cold Drink	Hot Drink	Total
Adult	24%	76%	100%
Child	68%	32%	100%

Complete the segmented bar graph to represent the data.

Use one bar for each row of the table.



6.2 This two-way table shows the number of adults and children who prefer sweet or salty snacks.

Complete the relative frequency table by row. Round to the nearest percent.

	Sweet Snack	Salty Snack	Total
Adult	57	88	145
Child	77	31	108
Total	134	119	253

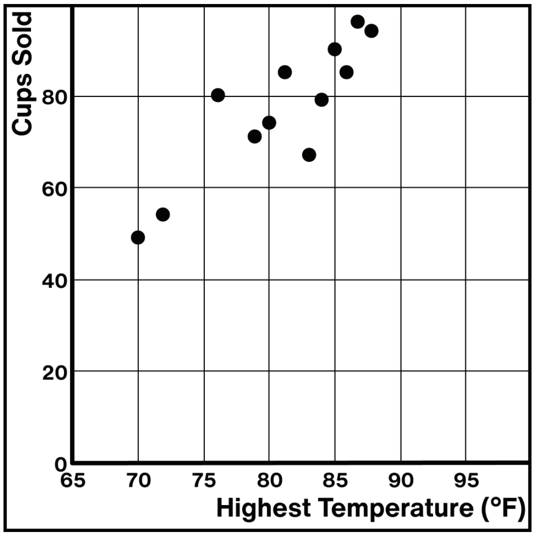
	Sweet Snack	Salty Snack	Total
Adult			100%
Child			100%

Unit 8.6, End-Unit Assessment: Form A Name ____________________

Jayla opened a lemonade stand during the summer. She noticed that she sold more lemonade on warmer days.

For each day she sold lemonade, she plotted the point (t, c):

- t represents highest temperature.
- c represents cups of lemonade sold.



7.1 Draw a line that is a good fit for the data.

7.2 The equation of Jayla's line of fit is $c = 2t - 89$.

Use this equation to predict how many cups of lemonade Jayla might sell on a day when the highest temperature is 74°F.

7.3 How many more cups of lemonade would Jayla expect to sell if the temperature increases by 5 °F?

Explain or show your thinking.

Reflection: Select a question to answer.

- ☐ What is something you are proud of from this unit?
- ☐ Write what you know about a topic from this unit that you weren't asked about today.
- ☐ Describe or show one strategy you found helpful in this unit.
  Name any students who helped you with this strategy.
- ☐ What else would you like your teacher to know?

Unit 8.6, End-Unit Assessment: Form A Name ____________________

1. A. $y = -\frac{1}{3}x + 2$

2. D. 157

3.1 *Responses vary.* Plot shows at least five points nearly on the same line with a positive slope, and one point not near the line.

3.2 *Responses vary.* Plot shows at least six points that are not nearly on the same line, with a generally negative trend.

4. ✓ A: Number of people in a checkout line
B: Time you have to wait to check out

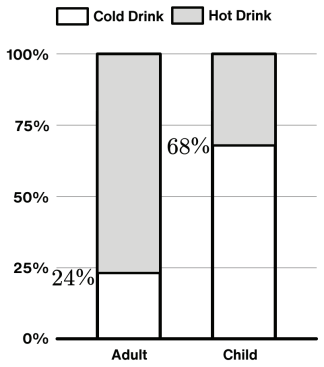
✓ A: Minutes you have walked
B: Number of steps you've walked

✓ A: Pounds of cherries you buy
B: Total cost of the cherries

5.

	Have Pet	Have No Pet	Total
7th Grade	102	48	150
8th Grade	107	68	175
Total	209	116	325

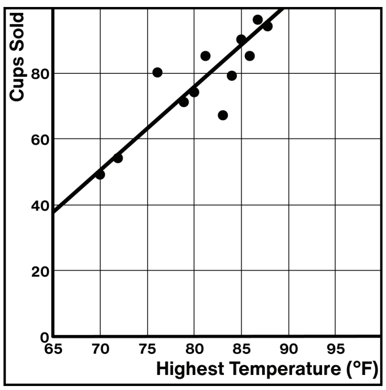
6.1



6.2

	Sweet Snack	Salty Snack	Total
Adult	39%	61%	100%
Child	71%	29%	100%

7.1 *Responses vary.*



7.2 59 cups

7.3 10 more cups
Explanations vary. The slope of the line is 2. This means that for each one-degree increase in temperature, Jayla can expect to sell about two more cups of lemonade. If the temperature increases by 5°F, she can expect to sell about 10 more cups of lemonade.

Unit 8.6, End Assessment Summary and Rubric: Form A

Content Standards Summary

Standard	8.SP.A.1	8.SP.A.2	8.SP.A.3	8.SP.A.4
Problems	3, 4	1, 7.1	7.2, 7.3	2, 5, 6

Problem 1
(Standards: **8.SP.A.2, MP7**)

In this problem, students identify an equation for a line fit to data on a graph. Students make use of the structure of the coordinate plane to determine an appropriate equation. This problem corresponds most directly to the work students did in Lesson 6: Interpreting Slopes.

Suggested Next Steps: If students struggle . . .
- Consider reminding students what they need in order to define the equation of a line: a point and a slope, or two points on the line.
- Consider revisiting Lesson 6, Activity 2, Screen 5.

Problem 2
(Standards: **8.SP.A.4, MP2**)

In this problem, students recognize what it means to have no association in bivariate data. Students reason abstractly and quantitatively as they use proportional reasoning in context. This problem corresponds most directly to the work students did in Lesson 10: Finding Associations.

Suggested Next Steps: If students struggle . . .
- Consider asking students to choose a direction (horizontal or vertical) in which to work the two-way table. Then ask them what should stay the same between rows/columns.
- Consider revisiting Lesson 10, Activity 1.

Problem 3

(Standards: **8.SP.A.1, MP1**)

In this problem, students construct a scatter plot that matches a description. Students must make sense of the problem by making correspondences between the verbal descriptions given and the visual they create. This problem corresponds most directly to the work students did in Lesson 7: Scatter Plot City.

Suggested Next Steps: If students struggle . . .

- **Math Language Development** Consider using the mathematical language routine Critique, Correct, Clarify to help students understand the terms *positive*, *negative*, *linear*, and *nonlinear* as they relate to correlation in a data set.
- Consider revisiting the Cool-Down in Lesson 7.

Problem 4

(Standard: **8.SP.A.1**)

In this problem, students recognize what it means to have a positive association between variables. This problem corresponds most directly to the work students did in Lesson 7: Scatter Plot City.

Suggested Next Steps: If students struggle . . .

- Consider asking students to identify all relevant quantities in a given relationship, then have them substitute test values as examples to determine the nature of the relationship.
- Consider revisiting Lesson 7, Activity 1.

Unit 8.6, End Assessment Summary and Rubric: Form A

Problem 5

(Standards: **8.SP.A.4, MP7**)

In this problem, students recognize how to represent data in a two-way table, using the structure of the table to complete missing information. This problem corresponds most directly to the work students did in Lesson 9: Tasty Fruit.

Suggested Next Steps: If students struggle . . .

- Consider having students complete just the first row, then the second row, and finally complete the third row using the information they just completed.
- Consider revisiting Lesson 9, Activity 2, Screen 7.

Problem 6

(Standards: **8.SP.A.4, MP6**)

In this problem, students use a two-way table to generate a segmented bar graph and a relative frequency table. Students attend to precision as they ensure their visual displays accurately reflect the given data. This problem corresponds most directly to the work students did in Lesson 10: Finding Associations.

Suggested Next Steps: If students struggle . . .

- **Math Language Development** Consider using the mathematical language routine Critique, Correct, Clarify to help students understand the terms *segmented bar graph* and *relative frequency table* and communicate the data represented in each.
- Consider revisiting Lesson 10, Activity 1.

Problem 7

(Standards: **8.SP.A.2, 8.SP.A.3, MP2**)

In this problem, students create and use a linear model between two quantitative variables. Students reason abstractly and quantitatively as they use a linear equation in context. This problem corresponds most directly to the work students did in Lesson 4: Dapper Cats and Lesson 5: Fit Fights.

Suggested Next Steps: If students struggle . . .

- Consider asking students to substitute two temperature values that are 5°F apart and compare the corresponding cups sold directly. Then ask students how their answer relates to a feature of the equation (the slope).
- Consider revisiting Lesson 4, Activity 1 or Lesson 5, Activity 1.

Unit 8.6, End Assessment Summary and Rubric: Form A

Problem	Standard	Meeting/Exceeding	Approaching	Developing	Beginning	
		4	3	2	1	0
1	8.SP.A.2, MP7	• $y = -\frac{1}{3}x + 2$			Students who select $y = -\frac{1}{3}x + 6$ may have used the x-intercept $(6, 0)$ instead of the y-intercept $(0, 2)$. Students who select $y = \frac{1}{3}x + 2$ may not have considered the sign of the slope. Students who select $y = \frac{1}{3}x + 6$ may have made both of the above errors.	Did not attempt.
2	8.SP.A.4, MP2	• 157			Students who select 33 may have reversed the percentages in each column. Students who select 85 may have preserved the absolute difference in each column. Students who select 107 may have calculated the sum of the numbers in the problem $11 + 24 + 72$.	Did not attempt.

Unit 8.6, End Assessment Summary and Rubric: Form A

Problem	Standard	Meeting/Exceeding	Approaching	Developing	Beginning	
		4	3	2	1	0
3.1	8.SP.A.1, MP1	Work is complete and correct. • Plot shows at least five points nearly on the same line with a positive slope and one point not near the line.	Work shows conceptual understanding and mastery, with minor errors. • Students who plot at least five points nearly on the same line and one point not near the line but with a negative slope may not understand positive and negative associations. • Students who plot at least six points nearly on the same line with a positive slope but do not include an outlier may not understand outliers.	Work shows a developing but incomplete conceptual understanding, with significant errors. • Students who plot a negative association without outliers may need additional support with this unit's vocabulary.	Weak evidence of understanding.	Did not attempt.
3.2	8.SP.A.1, MP1	Work is complete and correct. • Plot shows at least six points that are not on the same line, with a generally negative trend.	Work shows conceptual understanding and mastery, with minor errors. • Students who plot at least five points that are not on the same line but with a positive trend may not understand positive and negative associations.	Work shows a developing but incomplete conceptual understanding, with significant errors. • Students who plot a linear negative association may need additional support understanding the difference between linear and nonlinear associations.	Weak evidence of understanding. Student plots a positive linear association.	Did not attempt.

Unit 8.6, End Assessment Summary and Rubric: Form A

Problem	Standard	Meeting/Exceeding	Approaching	Developing	Beginning	
		4	**3**	**2**	**1**	**0**
4	8.SP.A.1	Student selects all of the correct choices and does not select any incorrect choices. • A: Number of people in a checkout line B: Time you have to wait to check out • A: Minutes you have walked B: Number of steps you've walked • A: Pounds of cherries you buy B: Total cost of the cherries	Student selects one or two of the correct choices and does not select any incorrect choices. Student selects all of the correct choices and one incorrect choice.	Student selects one or two of the correct choices but also includes an incorrect choice.	Student selects only incorrect choices. Student selects two or more incorrect choices with some correct choices.	Did not attempt.
5	8.SP.A.4, MP7	Work is complete and correct. 7th grade, Have no pet: 48 8th grade, Have pet: 107 Total • Have pet: 209 • Have no pet: 116 • Total: 325	Work shows conceptual understanding and mastery, with minor errors. Student correctly fills in four of the five missing values.	Work shows a developing but incomplete conceptual understanding, with significant errors. Student correctly completes the table for three of the five missing values. • Students who write 243 for "8th Grade, Have Pet" or 252 for "7th Grade, Have No Pet" may have added the two given values in the row.	Weak evidence of understanding. Student correctly fills in two or fewer of the five missing values.	Did not attempt.

Unit 8.6, End Assessment Summary and Rubric: Form A

Problem	Standard	Meeting/Exceeding	Approaching	Developing	Beginning	
		4	3	2	1	0
6.1	8.SP.A.4, MP6	Work is complete and correct. • The segmented bar graphs are accurate.	Work shows conceptual understanding and mastery, with minor errors. • Student reverses the hot and cold drink percentages for each row.	Work shows a developing but incomplete conceptual understanding, with significant errors. • Student reverses the hot and cold drink percentages and uses the incorrect bars for child and adult.	Weak evidence of understanding.	Did not attempt.
6.2	8.SP.A.4, MP6	Work is complete and correct. Adult: • Sweet snack: 39% • Salty snack: 61% Children: • Sweet snack: 71% • Salty snack: 29%	Work shows conceptual understanding and mastery, with minor errors. Students whose percentages are close to the correct values may have made rounding errors. Student correctly completes the table for three of the four values.	Work shows a developing but incomplete conceptual understanding, with significant errors. Student correctly completes the table for two of the four values. • Students who write 42.5% for "Adult, Sweet Snack" may have correctly calculated the relative frequency by column instead of by row.	Weak evidence of understanding.	Did not attempt.
7.1	8.SP.A.2, MP2	Work is complete and correct. • The line reasonably represents a fitting line for the data.	Work shows conceptual understanding and mastery, with minor errors. • The slope of the line generally follows the trend of the data but is shifted vertically.	Work shows a developing but incomplete conceptual understanding, with significant errors. • The line goes through the center of the data but does not fit the trend of the data.	Weak evidence of understanding.	Did not attempt.

Unit 8.6, End Assessment Summary and Rubric: Form A

Problem	Standard	Meeting/Exceeding	Approaching	Developing	Beginning	
		4	3	2	1	0
7.2	8.SP.A.3, MP2	• 59 cups	Work shows conceptual understanding and mastery, with some errors. Students may have correctly substituted 74 for t in the equation but then made a minor calculation error.	Work shows a developing but incomplete conceptual understanding, with significant errors. • Students who write 81.5 cups may have substituted 74 for c in the equation and then solved for t.	Weak evidence of understanding how to use the equation of a linear model.	Did not attempt.
7.3	8.SP.A.3, MP2	Student successfully answers the question and includes a logical and complete explanation. • 10 more cups The slope of the line is 2. This means that for each one-degree increase in temperature, Jayla can expect to sell about two more cups of lemonade. If the temperature increases by $5°$F, she can expect to sell about 10 more cups of lemonade.	Correct answer with minor flaws in explanation. Incorrect answer with logical and complete explanation.	Correct answer with incomplete explanation. Incorrect answer with explanation that communicates partial understanding of the situation. • Students who write 2 may have considered the slope of the equation.	Incorrect answer with incorrect explanation or without an explanation.	Did not attempt.

 Name ______________________________

1. Select **all** the expressions that are equal to $761 \div 5$.

   - ☐ $76.1 \div 0.05$
   - ☐ $762 \div 6$
   - ☐ $0.761 \div 0.005$
   - ☐ $7.61 \div 0.5$
   - ☐ $7610 \div 50$

2. Which is closest to the quotient $2967 \div 0.003$?

   A. $1\,000$

   B. $10\,000$

   C. $100\,000$

   D. $1\,000\,000$

3. Select **all** the expressions that are equivalent to $3^4 \cdot 3^2$.

   - ☐ 9^8
   - ☐ 9^3
   - ☐ 3^6
   - ☐ 9^6
   - ☐ 3^8

4. A new phone costs $\$450$.

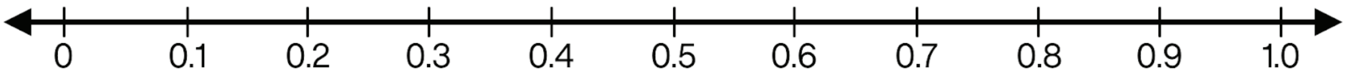
   There is a 40% discount on the price of the phone and an 8% sales tax on the discount price.

   What is the final cost of the phone after the discount and the sales tax?

 Name ____

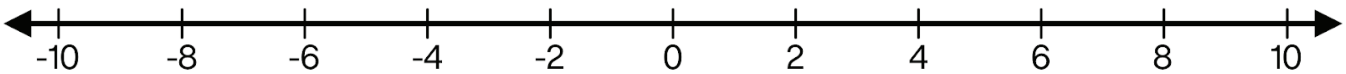
5. Plot and label these numbers on the same number line:

$$0.8\,,\ 0.65\,,\ 0.27\,,\ 0.52\,,\ 0.052$$



6. Plot and label these numbers on the same number line:

$$(-2)^1\,,\ (-2)^2\,,\ (-2)^3\,,\ \left(\frac{1}{2}\right)^2$$



7. Write three other fractions that are equivalent to $\frac{16}{128}$. Explain your thinking for each fraction.

Unit 8.7, Readiness Check

Answer Key

1. ✓ $0.761 \div 0.005$

   ✓ $7610 \div 50$

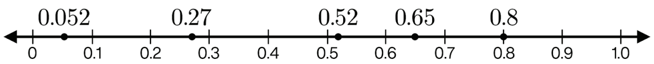
2. D. $1\ 000\ 000$

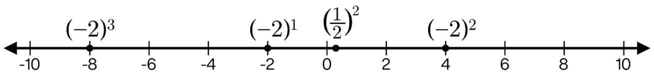
3. ✓ 9^3

   ✓ 3^6

4. $\$291.60$

   After the discount, the phone costs $\$270$ because $(0.6) \cdot 450 = 270$. The sales tax is 8% of $\$270$, which is $\$21.60$. The total cost including the sales tax is $\$291.60$ since $270 + 21.6 = 291.60$.

5. 

6. 

7. *Responses vary.*

   $\frac{1}{8}$, $\frac{2}{16}$, $\frac{3}{24}$

   The fraction $\frac{16}{128}$ can be written as $\frac{16 \cdot 1}{16 \cdot 8}$. This equals $\frac{1}{8}$ because it can be written as $\frac{16}{16} \cdot \frac{1}{8}$. $\frac{2}{16}$ and $\frac{3}{24}$ are possible because they are equal to $\frac{2}{2} \cdot \frac{1}{8}$ and $\frac{3}{3} \cdot \frac{1}{8}$ respectively.

Unit 8.7, Readiness Check Summary

For teachers who choose to spread out the questions, consider assigning the following:

- Problems 3 and 7 before Lesson 2
- Problems 1 and 4 before Lesson 7
- Problems 2, 5 and 6 before Lesson 8

Problem 1

(Standards: **6.NS.B.3, MP6**)

This question is intended to surface what students already know about quotients of decimals and place value. Students attend to precision when they use properties of division to identify equivalent expressions. This content first appears in Lesson 7: Scales and Weights, where students begin to represent large and small numbers using powers of 10.

Suggested Next Steps: If students struggle . . .

- Plan to review this question after Lesson 7. Consider inviting students to share how writing numbers using powers of 10 might be helpful.

Problem 2

(Standard: **6.NS.B.3**)

This question is intended to surface what students already know about using estimation and place value to determine a quotient. This content first appears in Lesson 11: Balance the Scale, where students multiply and divide numbers given in scientific notation to answer questions in context.

Suggested Next Steps: If students struggle . . .

- Plan to review this question before Activity 1 of Lesson 11. Invite students to think about how writing each number in scientific notation might be helpful.

Problem 3

(Standards: **6.EE.A.1, MP6**)

This question is intended to surface what students already know about equivalent expressions with positive whole number exponents. Students attend to precision when they use the properties of exponents to identify equivalent expressions. This content first appears in Lesson 2: Combining Exponents, where students write equivalent expressions involving the product of powers and powers of powers.

Suggested Next Steps: If students struggle . . .

- Consider giving them time to review and revise their response after Lesson 2 or as part of the Cool-down.

Unit 8.7, Readiness Check Summary

Problem 4

(Standards: **7.RP.A.3**)

This question is intended to surface what students already know about solving problems involving percentages. This content first appears in Lesson 7: Scales and Weights, where students begin to represent large and small numbers using powers of 10.

Suggested Next Steps: If students struggle . . .

- Plan to review calculations with percentages when time allows throughout the unit.

Problem 5

(Standards: **5.NBT.A.3, MP7**)

This question is intended to surface what students already know about the relative size of decimals using the structure of the number line. This content first appears in Lesson 8: Point Zapper, where students represent large and small numbers on number lines.

Suggested Next Steps: If students struggle . . .

- Plan to extend Lesson 8's Warm-Up and revisit this question. If it does not come up naturally, discuss the size of the intervals on the number line.

Problem 6

(Standards: **6.EE.A.1, 6.NS.C.6, MP6**)

This question is intended to surface what students know about numbers raised to different exponents. Students attend to precisions when they determine the sign of their answer. This content first appears in Lesson 8: Point Zapper, where students use number lines to represent large and small numbers.

Suggested Next Steps: If students struggle . . .

- Consider reviewing this problem before Lesson 8. Invite students to share how they know where each number belongs on the number line.

Problem 7

(Standards: **4.NF.A.1, 5.NF.B.5.B, MP1**)

This question is intended to surface what students already know about equivalent fractions. Students may make sense of the problem by either reducing or multiplying. This content first appears in Lesson 3: Power Pairs, where students determine if two expressions are equivalent.

Suggested Next Steps: If students struggle . . .

- Consider making connections between writing equivalent fractions and writing equivalent expressions involving exponents as it comes up throughout Lesson 3.

Unit 8.7, Quiz: Lessons 1–6 Name ______________________

1. Three of these equations are false and one is true.

   Circle the **true** equation.

   A. $1^0 = 0$

   B. $3^{-2} \cdot 4^6 = 12^4$

   C. $(2^5)^5 = 2^{10}$

   D. $\frac{1}{10^2} = 10^{-2}$

2. Select **all** of the expressions that are equal to 12^8.

   ☐ $12^{10} \cdot 12^{-2}$

   ☐ $3^2 \cdot 4^6$

   ☐ $(12^8)^0$

   ☐ $\frac{12^{10}}{12^2}$

   ☐ $2^8 \cdot 6^8$

3. Rewrite each expression using a single exponent.

3.1 $\frac{10^2}{10^5}$	3.2 $10^2 \cdot 10^6 \cdot 10$	3.3 $(10^2)^3$

4. Place a number in each box so that each equation is true.

4.1 $3^{\square} \cdot 3^{\square} = 3^0$	4.2 $(3^{\square})^{\square} = \frac{1}{3^{10}}$	4.3 $\frac{3^{\square} \cdot 3^{-2}}{3^{\square}} = 3$

 Name ____________________________________

5. Here are three expressions that have the same value:

A. $2^3 \cdot 2^3$ B. 2^6 C. 4^3

5.1 Explain how you can tell that these expressions are equivalent.

5.2 Using one or more exponents, write another expression that has the same value as the ones above, and explain how you know this expression has the same value as the others.

5.3 Precious wrote that $\frac{2^{-4}}{2^{-10}}$ has the same value as the other expressions.
Is this correct?

Explain how you know.

Unit 8.7, Quiz: Lessons 1–6

Answer Key

1. D. $\frac{1}{10^{2}} = 10^{-2}$

2. ✓ $12^{10} \cdot 12^{-2}$
   ✓ $\frac{12^{10}}{12^{2}}$
   ✓ $2^{8} \cdot 6^{8}$

3.1 10^{-3} or $\frac{1}{10^{3}}$ (or equivalent)

3.2 10^{9} (or equivalent)

3.3 10^{6} (or equivalent)

4.1 Any pair of exponents whose sum is zero.

4.2 Any pair of exponents whose product is -10.

4.3 Any pair of exponents whose difference is 3.

5.1 *Responses vary.* All of the expressions equal 64 when evaluated.

5.2 *Responses vary.* $(2^{3})^{2}$. I know it is equal because one of the given expressions is $2^{3} \cdot 2^{3}$, and multiplying something by itself is the same as raising it to the second power.

5.3 *Responses vary.* $\frac{2^{-4}}{2^{-10}}$ is equal to $2^{(-4+10)}$ which is equal to 2^{6}. This is the same as B and evaluates to 64, which is equivalent to all of the given expressions.

Unit 8.7, Quiz: Summary and Rubric

Content Standards Summary

Standard	8.EE.A.1
Problems	1, 2, 3, 4, 5

Problem 1

(Standards: **8.EE.A.1, MP6**)

In this problem, students reason about the value of expressions involving positive, zero, and negative exponents. Students attend to precision when they apply properties of exponents to determine equivalent expressions. This problem corresponds most directly to the work students did in Lesson 5: Zero and Negative Exponents.

Suggested Next Steps: If students struggle . . .

- Consider asking students to convert all negative exponents to positive exponents. Then, if more support is needed, have students express the exponents as repeated multiplication (Note: students should not do the multiplication).
- Consider revisiting Lesson 5, Activity 1.

Problem 2

(Standards: **8.EE.A.1, MP6**)

In this problem, students determine if two expressions involving positive, zero, and negative exponents are equivalent. Students attend to precision when they apply properties of exponents to determine equivalent expressions. This problem corresponds most directly to the work students did in Lesson 5: Zero and Negative Exponents.

Suggested Next Steps: If students struggle . . .

- Consider having students identify what is the same and what is different in each expression. Then ask if they can use properties of exponents to combine the parts of each expression into a single power.
- Consider revisiting Lesson 5, Activity 1.

Unit 8.7, Quiz: Summary and Rubric

Problem 3

(Standard: **8.EE.A.1**)

In this problem, students rewrite products of powers, quotients of powers, and powers of powers using a single exponent. This problem corresponds most directly to the work students did in Lesson 4: Rewriting Powers.

Suggested Next Steps: If students struggle . . .

- Consider having students write each expression as repeated multiplication, then have them recombine (or cancel) factors into a single term.
- Consider revisiting Lesson 4, Activity 1, Screen 4.

Problem 4

(Standards: **8.EE.A.1, MP7**)

In this problem, students determine unknown exponents to create true statements using properties of exponents. Students make use of the structure of each expression and properties of exponents to make each equation true. This problem corresponds most directly to the work students did in Lesson 6: Write a Rule.

Suggested Next Steps: If students struggle . . .

- Consider having students get started by writing small powers in each blank, simplifying the resulting expression, and then having them adjust the numbers they wrote based on the result.
- Consider revisiting Lesson 6, Activity 1.

Problem 5

(Standards: **8.EE.A.1, MP3**)

In this problem, students justify that exponential expressions involving powers of powers and products of powers are equivalent. Students construct a viable argument for why the expressions are equivalent. This problem corresponds most directly to the work students did in Lesson 3:
Power Pairs.

Unit 8.7, Quiz: Summary and Rubric

Suggested Next Steps: If students struggle . . .

- Consider asking students to compute the value of each expression, then work backward to determine why each expression evaluates to the same number.
- Consider revisiting Lesson 3, Activity 1.

Problem	Standard	Meeting/Exceeding	Approaching	Developing	Beginning	
		4	3	2	1	0
1	8.EE.A.1	Correct choice. • $\frac{1}{10^2} = 10^{-2}$			Incorrect choice. *Students who selected* $(2^5)^5 = 2^{10}$ *may have known to keep the same base and thought that addition was needed to simplify a power of a power.*	Did not attempt.
2	8.EE.A.1	**All correct** choices and **no incorrect** choices. • $12^{10} \cdot 12^{-2}$ • $\frac{12^{10}}{12^2}$ • $2^8 \cdot 6^8$	**One or two correct** choices and **no incorrect** choice. **All correct** choices and **one incorrect** choice.	**One or two correct** choices but also includes **two incorrect** choices.	**Only incorrect** choices. **Two incorrect** choices with some correct choices.	Did not attempt.

Unit 8.7, Quiz: Summary and Rubric

Problem	Standard	Meeting/Exceeding	Approaching	Developing	Beginning	
		4	**3**	**2**	**1**	**0**
3.1	8.EE.A.1	Correct answer. • 10^{-3} (or equivalent)	Work shows **conceptual understanding** with some errors. *E.g., Student simplifies to* $\frac{1}{1000}$ *without using an exponent.*	Work shows **incomplete understanding** with significant errors. *E.g., Student makes a sign error, such as writing* 10^3.	Work shows **limited understanding** of rewriting products of powers, quotients of powers, and powers of powers using a single exponent.	Did not attempt.
3.2	8.EE.A.1	Correct answer. • 10^9 (or equivalent)	Work shows **conceptual understanding** with some errors. *E.g., Student simplifies to* $1\,000\,000\,000$ *without using an exponent.*	Work shows **incomplete understanding** with significant errors. *Students who wrote* 10^8 *may have known to add the exponents but did not know that* • 10 *is the same as* • 10^1.	Work shows **limited understanding** of rewriting products of powers, quotients of powers, and powers of powers using a single exponent.	Did not attempt.
3.3	8.EE.A.1	Correct answer. • 10^6 (or equivalent)	Work shows **conceptual understanding** with some errors. *E.g., Student simplifies to* $1\,000\,000$ *without using an exponent.*	Work shows **incomplete understanding** with significant errors. *Student who wrote* 10^5 *may have known to keep the same base and thought that addition was needed to simplify a power of a power.*	Work shows **limited understanding** of rewriting products of powers, quotients of powers, and powers of powers using a single exponent.	Did not attempt.

Unit 8.7, Quiz: Summary and Rubric

Problem	Standard	Meeting/Exceeding	Approaching	Developing	Beginning	
		4	**3**	**2**	**1**	**0**
4	8.EE.A.1	All correct answers. • Equation 1: Any pair of exponents whose sum is zero. • Equation 2: Any pair of exponents whose product is -10. • Equation 3: Any pair of exponents whose difference is 3.	Work shows **conceptual understanding** with some errors. *Two equations are correct.*	Work shows **incomplete understanding** with significant errors. *One equation is correct.*	Work shows **limited understanding** of rewriting products of powers, quotients of powers, and powers of powers using a single exponent.	Did not attempt.
5.1	8.EE.A.1	Correct explanation. E.g., All of the expressions equal 64 when evaluated.	Work shows **conceptual understanding** with some errors. *E.g., Each expression has the same number of 2s.*	Work shows **incomplete understanding** with significant errors. *E.g., They are all the same when multiplied.*	Work shows **limited understanding** of rewriting products of powers, quotients of powers, and powers of powers using a single exponent.	Did not attempt.

Unit 8.7, Quiz: Summary and Rubric

Problem	Standard	Meeting/Exceeding	Approaching	Developing	Beginning	
		4	**3**	**2**	**1**	**0**
5.2	8.EE.A.1	**Correct answer** with **correct explanation.** Some possible expressions: • $(2^3)^2$ • $4 \bullet 4^2$ • 8^2 *E.g., I know it is equal because one of the given expressions is* $2^3 \cdot 2^3$*, and multiplying something by itself is the same as raising it to the second power.*	**Correct answer** with **minor flaws in explanation.** *E.g., Each expression has the same number of 2s.* **Incorrect answer** with **logical and complete explanation.**	**Correct answer** with **incomplete explanation.** *E.g., They are all the same when multiplied.* **Incorrect answer** with **explanation that shows partial understanding.**	**Incorrect answer** with **no explanation or incorrect explanation.**	Did not attempt.
5.3	8.EE.A.1	**Correct answer** with **correct explanation.** • Yes *E.g.,* $\frac{2^{-4}}{2^{-10}}$ *is equal to* $2^{(-4+10)}$*, which is equal to* 2^6*. This is the same as B and evaluates to* 64*, which is equivalent to all of the given expressions.*	**Correct answer** with **minor flaws in explanation.** *E.g., Rewrite* 2^{-10} *as* 2^{10} *and then multiply.* **Incorrect answer** with **logical and complete explanation.**	**Correct answer** with **incomplete explanation.** *E.g., Move* 2^{-10} *to the top and then simplify.* **Incorrect answer** with **explanation that shows partial understanding.**	**Incorrect answer** with **no explanation or incorrect explanation.**	Did not attempt.

Unit 8.7, End-Unit Assessment: Form A Name ________________________________

1. Which expression has the same value as 4^{12}?

A. $4^2 \cdot 4^{10}$ B. $4^6 + 4^6$ C. $4^3 \cdot 4^4$ D. 12^4

2. Select **all** the expressions that have the same value as $4 \cdot 10^6$.

☐ 40^6 ☐ $4\,000\,000$ ☐ $40 \cdot 10^5$ ☐ $\frac{1.2 \cdot 10^9}{3 \cdot 10^2}$ ☐ $400\,000$

3. About $3.9 \cdot 10^7$ people live in California.
About $1.3 \cdot 10^6$ people live in Maine.

About how many more people live in California than live in Maine?

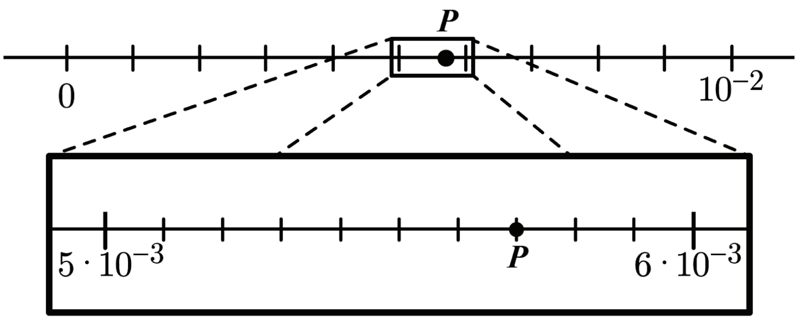
A. $2.6 \cdot 10^6$

B. $2.6 \cdot 10^7$

C. $3.77 \cdot 10^6$

D. $3.77 \cdot 10^7$

4. What number is represented by point P?



5. A person blinks about 20 times each minute.

   About how many times will a person blink in 80 years ($4.2 \cdot 10^7$ minutes)?

   Write your answer in scientific notation.

Place a number in each box so that:

- Each equation is true.
- Each equation has at least one negative number.

6.1

$$2^{\square} \cdot 2^{\square} = 2^0$$

6.2

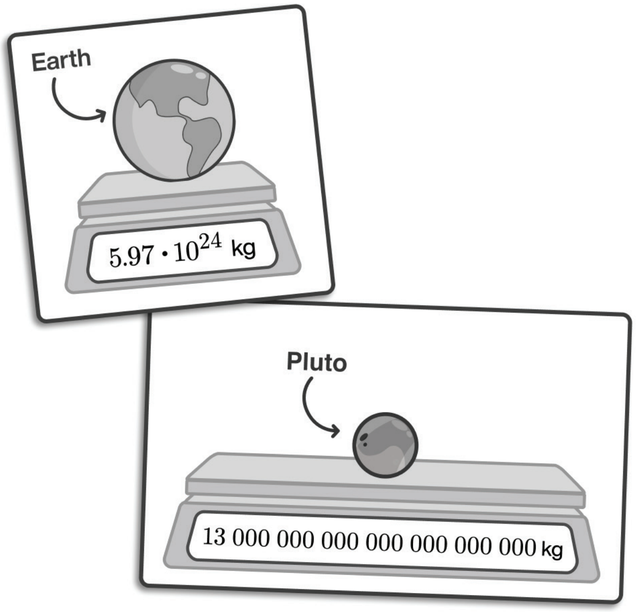
$$\frac{2^3}{2^{\square}} = 2^{\square}$$

6.3

$$2^{-3} \cdot \square^{-3} = 10^{\square}$$

Unit 8.7, End-Unit Assessment: Form A Name ______________________________

7.1 Calculate the combined mass of Earth and Pluto.

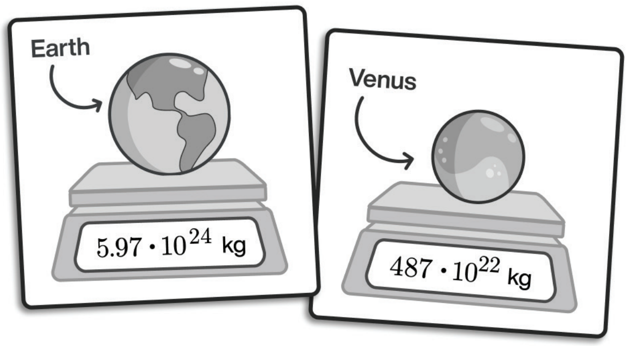


7.2 Amoli says the mass of 100 Plutos is less than the mass of Earth.

Is this correct?
Explain or show your thinking.

7.3 What is the difference between the mass of Earth and the mass of Venus?

Explain or show your thinking.



Unit 8.7, End-Unit Assessment: Form A Name ___________________________

Reflection: Select a question to answer.

☐ What is something you are proud of from this unit?

☐ Write what you know about a topic from this unit that you weren't asked about today.

☐ Describe or show one strategy you found helpful in this unit.
Name any students who helped you with this strategy.

☐ What else would you like your teacher to know?

1. A. $4^2 \cdot 4^{10}$

2. ✓ $4\ 000\ 000$
   ✓ $40 \cdot 10^5$
   ✓ $\dfrac{1.2 \cdot 10^9}{3 \cdot 10^2}$

3. D. $3.77 \cdot 10^7$

4. $5.7 \cdot 10^{-3}$ or 0.0057 (or equivalent)

5. $8.4 \cdot 10^8$ times

6.1 Any pair of a positive and a negative exponent whose sum is zero.
Responses vary. $2^{-3} \cdot 2^3 = 2^0$

6.2 Any pair of a positive and a negative exponent whose sum is 3.
Responses vary. $\dfrac{2^3}{2^{-1}} = 2^4$

6.3 $2^{-3} \cdot 5^{-3} = 10^{-3}$

7.1 $5.983 \cdot 10^{24}$ kg (or equivalent)

7.2 Yes.
Explanations vary. 100 Plutos would have a mass of $1.3 \cdot 10^{24}$ kg, which is less than the mass of Earth.

7.3 $1.1 \cdot 10^{24}$ kg (or equivalent)
Explanations vary. In order to subtract, I rewrote Venus's mass as $4.87 \cdot 10^{24}$, then I subtracted the coefficients.

Unit 8.7, End Assessment Summary and Rubric: Form A

Content Standards Summary

Standard	8.EE.A.1	8.EE.A.3	8.EE.A.4
Problems	1, 6	7.2	2, 3, 4, 5, 7.1, 7.3

Problem 1
(Standard: **8.EE.A.1**)

In this problem, students identify equivalent expressions involving positive exponents. This problem corresponds most directly to the work students did in Lesson 2: Combining Exponents.

Suggested Next Steps: If students struggle . . .
- Consider reviewing the properties of combining exponents, then ask students how many total factors should be in their product.
- Consider revisiting Lesson 2, Activity 1, Screen 2.

Problem 2
(Standard: **8.EE.A.4**)

In this problem, students compare numbers expressed in both decimal form and scientific notation. This problem corresponds most directly to the work students did in Lesson 9: Use Your Powers.

Suggested Next Steps: If students struggle . . .
- Consider reminding students about the order of operations and have them expand the given exponent and product.
- Consider revisiting Lesson 9, Activity 1.

Unit 8.7, End Assessment Summary and Rubric: Form A

Problem 3

(Standard: **8.EE.A.4**)

In this problem, students subtract numbers expressed in scientific notation in context. This problem corresponds most directly to the work students did in Lesson 12: City Lights.

Suggested Next Steps: If students struggle . . .

- Consider asking students to first express the numbers using the same power of 10.
- Consider revisiting Lesson 12, Activity 1, Screen 8.

Problem 4

(Standards: **8.EE.A.4, MP7**)

In this problem, students use the structure of the number line and scientific notation to identify very small numbers on the number line. This problem corresponds most directly to the work students did in Lesson 8: Point Zapper.

Suggested Next Steps: If students struggle . . .

- Consider asking students how they would evenly divide a similar number line between 5 and 6, then ask how they can relate that number line to the given number line.
- Consider revisiting Lesson 8, Activity 1, Screen 3.

Problem 5

(Standards: **8.EE.A.4, MP2**)

In this problem, students reason abstractly and quantitatively to multiply large numbers in context and express the result in scientific notation. This problem corresponds most directly to the work students did in Lesson 11: Balance the Scale.

Suggested Next Steps: If students struggle . . .

- Consider having students start with a similar problem that uses a smaller exponent, such as $4.2 \cdot 10^2$, so they can expand the result fully and then rewrite it in scientific notation. Then have students use this insight on the value with the larger exponent.
- Consider revisiting Lesson 11, Activity 1.

Unit 8.7, End Assessment Summary and Rubric: Form A

Problem 6

(Standards: **8.EE.A.1, MP7**)

In this problem, students rewrite products and quotients of powers using a single exponent. Students make use of the structure of each expression and properties of exponents to make each equation true. This problem corresponds most directly to the work students did in Lesson 4: Rewriting Powers and Lesson 5: Zero and Negative Exponents.

Suggested Next Steps: If students struggle . . .

- Consider having students write their negative exponent first, then fill in the other values in the expression to accommodate the negative exponent.
- Consider revisiting Problems 1 or 2 from Lesson 4: Practice Problems.

Problem 7

(Standards: **8.EE.A.4, 8.EE.A.3, MP2**)

In this problem, students add, subtract, and compare numbers expressed in decimal form and scientific notation in the context of comparing planetary weight. This problem corresponds most directly to the work students did in Lesson 13: Star Power.

Suggested Next Steps: If students struggle . . .

- Consider asking students to express all quantities first in scientific notation, then adjust their expressions so that each has a common power of 10.
- Consider revisiting Lesson 13, Activity 1.

Unit 8.7, End Assessment Summary and Rubric: Form A

Problem	Standard	Meeting/Exceeding	Approaching	Developing	Beginning	
		4	**3**	**2**	**1**	**0**
1	8.EE.A.1	• $4^2 \cdot 4^{10}$			• Students who select $4^6 + 4^6$ may remember that exponents are added but not understand when and why that rule works. • Students who select $4^3 \cdot 4^4$ may be multiplying the exponents.	Did not attempt.
2	8.EE.A.4	Student selects all of the correct choices and does not select any incorrect choices. • $4\,000\,000$ • $40 \cdot 10^5$ • $\frac{1.2 \cdot 10^9}{3 \cdot 10^2}$	Student selects one or two of the correct choices and does not select any incorrect choices. Student selects all of the correct choices and one incorrect choice.	Student selects one or two of the correct choices but also includes an incorrect choice.	Student selects only incorrect choices. Student selects two or more incorrect choices with some correct choices.	Did not attempt.
3	8.EE.A.4	• $3.77 \cdot 10^7$			• Students who select $2.6 \cdot 10^6$ or $2.6 \cdot 10^7$ may have subtracted the coefficients without first considering the exponents. • Students who select $3.77 \cdot 10^6$ may have correctly subtracted the values written with the same power of 10 but made an error in converting to scientific notation.	Did not attempt.

Unit 8.7, End Assessment Summary and Rubric: Form A

Problem	Standard	Meeting/Exceeding	Approaching	Developing	Beginning	
		4	**3**	**2**	**1**	**0**
4	8.EE.A.4, MP7	Work is complete and correct. • $5.7 \cdot 10^{-3}$ or 0.0057 (or equivalent)	Work shows conceptual understanding and mastery, with some errors. • Students who write $5.6 \cdot 10^{-3}$ or $5.8 \cdot 10^{-3}$ may have incorrectly counted the tick marks. • Students who write $5.7 \cdot 10^{3}$ may have forgotten to write the negative in front of the exponent.	Work shows a developing but incomplete conceptual understanding, with significant errors. • Students who write 5.7 may have correctly determined the value on the number line but not the power of 10.	Weak evidence of understanding how to identify a number on the number line using scientific notation.	Did not attempt.
5	8.EE.A.4, MP2	Work is complete and correct. • $8.4 \cdot 10^{8}$ times	Work shows conceptual understanding and mastery, with some errors. • Students who write $8.4 \cdot 10^{7}$ or $8.4 \cdot 10^{9}$ may have correctly multiplied the coefficients but did not account for the exponent when writing in scientific notation.	Work shows a developing but incomplete conceptual understanding, with significant errors. • Students who write $2.1 \cdot 10^{6}$ may have divided instead of multiplied.	Weak evidence of understanding how to solve a problem involving quantities in scientific notation.	Did not attempt.

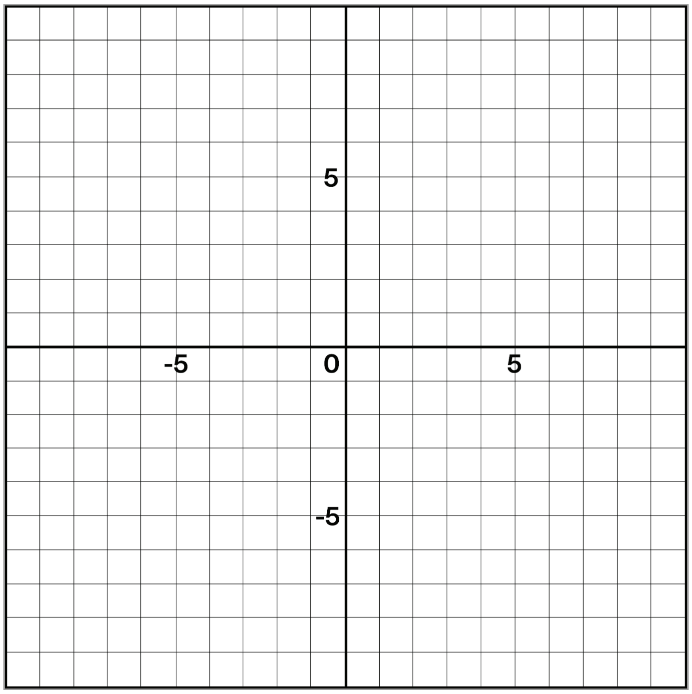
Unit 8.7, End Assessment Summary and Rubric: Form A

Problem	Standard	Meeting/Exceeding	Approaching	Developing	Beginning	
		4	3	2	1	0
6	8.EE.A.1, MP7	Work is complete and correct. *Responses vary.*	Work shows conceptual understanding and mastery, with minor errors. Student correctly completes two of the three equations.	Work shows a developing but incomplete conceptual understanding, with significant errors. Student correctly completes one of the three equations.	Weak evidence of understanding.	Did not attempt.
7.1	8.EE.A.4, MP2	Work is complete and correct. • $5.983 \cdot 10^{24}$ kg (or equivalent)	Work shows conceptual understanding and mastery, with some errors. • Students may incorrectly convert the mass of Pluto to scientific notation before adding.	Work shows a developing but incomplete conceptual understanding, with significant errors. • Students who write $7.27 \cdot 10^{46}$ may have correctly written the mass of Pluto using scientific notation, then added both the coefficients and the exponents.	Weak evidence of understanding.	Did not attempt.

Unit 8.7, End Assessment Summary and Rubric: Form A

Problem	Standard	Meeting/Exceeding	Approaching	Developing	Beginning	
		4	3	2	1	0
7.2	8.EE.A.3, MP2	Student successfully answers the question and includes a logical and complete explanation. • Yes 100 Plutos would have a mass of $1.3 \cdot 10^{24}$ kg, which is less than the mass of Earth.	Correct answer with minor flaws in explanation. Incorrect answer with logical and complete explanation. • Students who select "No" but then correctly explain that the mass of 100 Plutos is about $1.3 \cdot 10^{24}$ kg may have misunderstood the question.	Correct answer with incomplete explanation. Incorrect answer with explanation that communicates partial understanding of the situation. • Students who select "Yes" but do not compare the mass of Earth and 100 Plutos may have reasoned about a solution without verifying numerically.	Incorrect answer without an explanation or with an incorrect explanation.	Did not attempt.
7.3	8.EE.A.4, MP2	Student successfully answers the question and includes a logical and complete explanation. • $1.1 \cdot 10^{24}$ kg (or equivalent) In order to subtract, I rewrote Venus's mass as $4.87 \cdot 10^{24}$, then I subtracted the coefficients.	Correct answer with minor flaws in explanation. Incorrect answer with logical and complete explanation. • Students may have made an error subtracting 5.9 and 4.87 but correctly wrote their result as their coefficient times 10^{24}.	Correct answer with incomplete explanation. Incorrect answer with explanation that communicates partial understanding of the situation. • Students who write $481.03 \cdot 10^{2}$ may have subtracted the coefficients and the exponents separately.	Incorrect answer without an explanation or with an incorrect explanation.	Did not attempt.

Unit 8.8, Readiness Check Name ______________________________



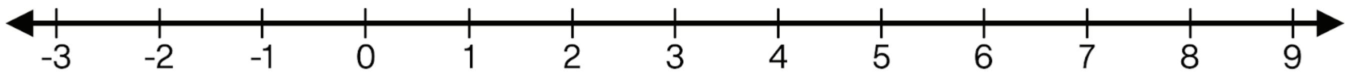
1. How long is the segment from $(-5,\ 2)$ to $(-5,\ -8)$?

   Use the graph if it helps you with your thinking.

2. Evaluate each expression for the given value.

2.1 a^2 when $a = \frac{3}{4}$	2.2 b^3 when $b = 1.1$

3. Plot these numbers on the number line: $\frac{3}{4}$, -1.5, 3^2, 0.5^3



 Name ______________________

4. Find a fraction that is equal to each decimal.

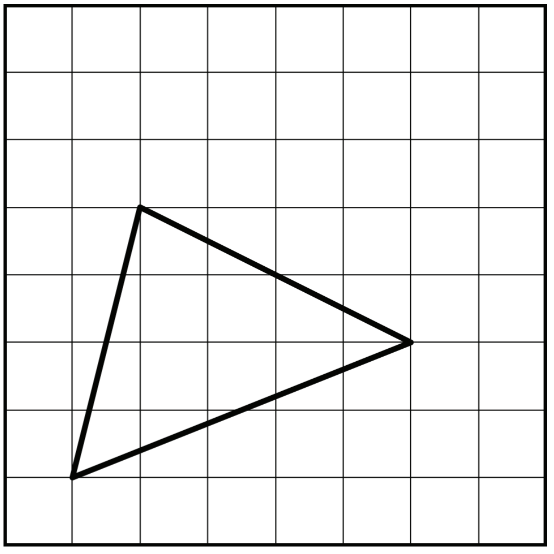
4.1 0.4	4.2 1.15	4.3 0.125

5. Find a decimal that is equal to each fraction.

5.1 $\frac{3}{5}$	5.2 $\frac{271}{100}$	5.3 $\frac{1}{9}$

6. What is the area of this triangle (in square units)?

Explain your thinking.



7. Find a solution for each equation.

7.1 $a^2 = 25$ $a =$	7.2 $b^3 = 8$ $b =$	7.3 $10^c = 1000$ $c =$

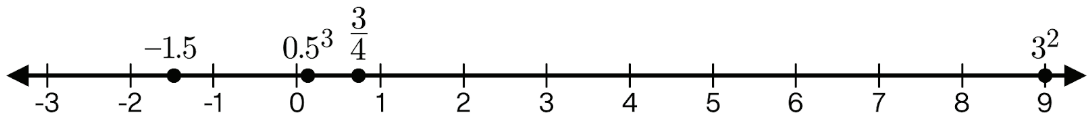
Answer Key

1. 10 units

2.1 $\frac{9}{16}$ (or equivalent)

2.2 1.331 (or equivalent)

3.



4.1 $\frac{4}{10}$ or $\frac{2}{5}$ (or equivalent)

4.2 $\frac{115}{100}$ or $\frac{23}{20}$ (or equivalent)

4.3 $\frac{125}{1000}$ or $\frac{1}{8}$ (or equivalent)

5.1 0.6 (or equivalent)

5.2 2.71 (or equivalent)

5.3 $0.\overline{1}$ or 0.111 (rounded to three or more decimal places)

6. *Explanations vary.* Draw a rectangle around the triangle. This rectangle has area of 20 square units. Then subtract away the area of three right triangles. These triangles have areas of 5, 4, and 2 square units, so the original triangle has an area of 9 square units.

7.1 $a = 5$ or $a = –5$

7.2 $b = 2$

7.3 $c = 3$

Unit 8.8, Readiness Check Summary

For teachers who choose to spread out the questions, consider assigning the following:

- Problems 6 and 7 before Lesson 1
- Problems 2 and 3 before Lesson 3
- Problem 1 before Lesson 11
- Problems 4 and 5 before Lesson 12

Problem 1

(Standards: **6.G.A.3, MP7**)

This question is intended to surface what students already know about using the structure of the coordinate plane to determine the distance between two points that share the same x- or y-coordinate in preparation for their work calculating distances in the coordinate plane. This content first appears in Lesson 11: Pond Hopper.

Suggested Next Steps: If students struggle . . .

- Consider spending more than the suggested time on Lesson 11's Warm-Up. Invite students to share strategies for determining the distance between two points that share one coordinate.

Problem 2

(Standard: **6.EE.A.1**)

This question is intended to surface what students already know about calculating squares and cubes of rational numbers. This content first appears in Lesson 3: Between Squares and in Lesson 5: Filling Cubes, where students calculate square roots and cube roots.

Suggested Next Steps: If students struggle . . .

- Consider revisiting Problem 2.1 before Lesson 3's Warm-Up and Problem 2.2 before Lesson 5's Warm-Up. Encourage students to use the Desmos scientific calculator to help them calculate the values of square and cube roots as needed throughout the unit.

Problem 3

(Standards: **6.EE.A.1, 6.NS.C.6.C, MP7**)

This question is intended to surface what students already know about the value of numbers less than 1 raised to different exponents relative to more familiar numbers. Students use the structure of the number line to support their thinking. This content first appears in Lesson 4: Root Down, where students represent square roots as points on a number line.

Suggested Next Steps: If students struggle . . .

- Plan to spend extra time during Lesson 4's Warm-Up. Consider inviting students to discuss where 3^2 and 0.5^3 would go on the number line.

Problem 4

(Standards: **4.NF.C, MP7**)

This question is intended to surface what students already know about writing decimals as fractions. Students make use of the structure of place value in their conversions. This content first appears in Lesson 13: Decimals to Fractions, where students express repeating decimals as fractions.

Suggested Next Steps: If students struggle . . .

- Plan to take opportunities starting in Lesson 12 to practice writing numbers in different forms. This skill will be particularly important in Lesson 12: Fractions to Decimals and in Lesson 13: Decimals to Fractions.

Problem 5

(Standards: **7.NS.A.2.D, MP7**)

This question is intended to surface what students already know about writing fractions as decimals. Students make use of structure when writing equivalent fractions with denominators that lend themselves to decimal expression. This content first appears in Lesson 12: Fractions to Decimals, where students express fractions as either repeating or terminating decimals.

Suggested Next Steps: If students struggle . . .

- Plan to take opportunities starting in Lesson 12 to practice writing numbers in different forms. This skill will be particularly important in Lesson 12: Fractions to Decimals and in Lesson 13: Decimals to Fractions.

Problem 6

(Standards: **6.G.A.1, MP7**)

This question is intended to surface strategies students use to calculate the area of a triangle using the structure of a grid. This content first appears in Lesson 1: Tilted Squares, where students calculate areas of squares on a grid whose side lengths do not align with grid lines.

Suggested Next Steps: If students do well . . .

- It may be possible to skip or move faster through Lesson 1's Warm-Up.

Problem 7

(Standards: **6.EE.A.1, 8.EE.A**)

This question is intended to surface what intuitions students already have about square and cube roots. Students are not expected to "take the square root of each side" to solve equations like this. This content first appears in Lesson 2: From Squares to Roots, where students use square root notation to represent the side length of a square given its area.

Suggested Next Steps: If students struggle . . .

- Plan to revisit this question after Lesson 2. If needed, provide a list or visual display of perfect squares and cubes and highlight the values of perfect squares and cubes as they arise throughout the unit.

Unit 8.8, Quiz: Lessons 1–5 Name ______________________________

1. Which value is an exact solution to the equation $z^2 = 20$?

   A. $z = 10$

   B. $z = \sqrt{20}$

   C. $z = 4.5$

   D. $z = \sqrt{10}$

2. Which value is the exact edge length of a cube whose volume is 36 cubic inches?

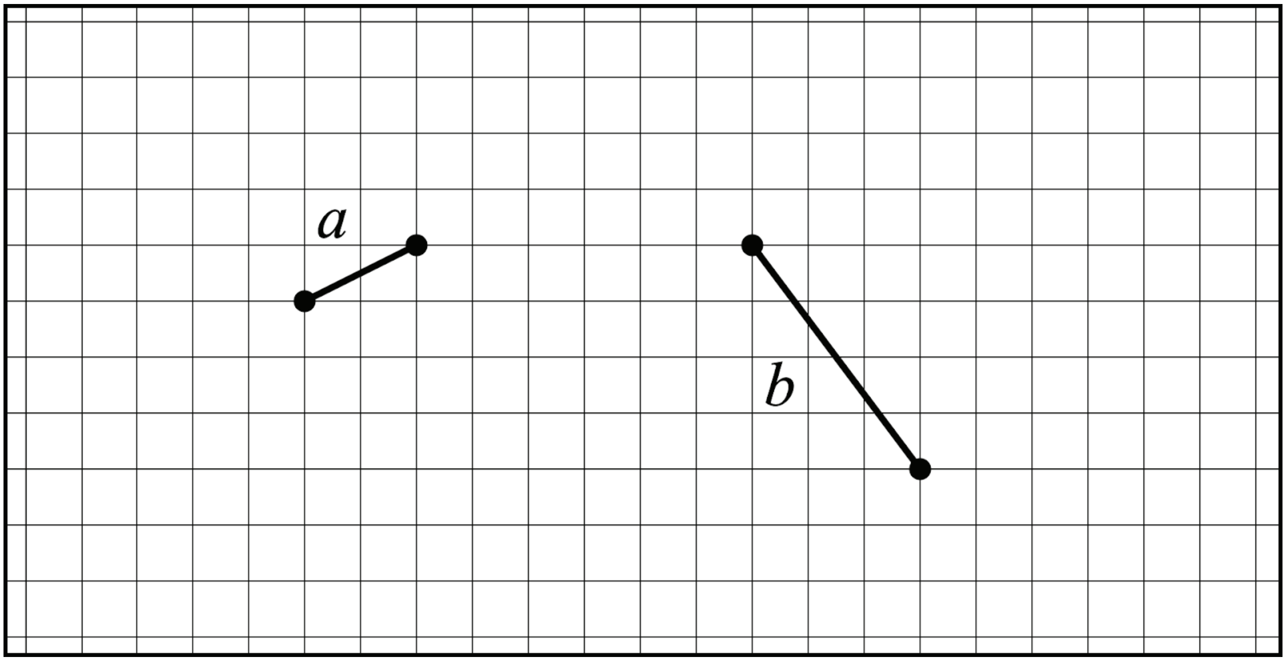
   A. $\sqrt[3]{36}$ inches

   B. 6 inches

   C. $\sqrt{36}$ inches

   D. 12 inches

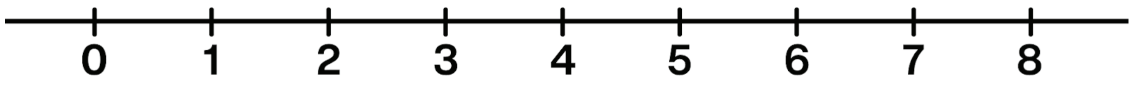
3. Determine the exact length of each line segment. Explain or show your reasoning.



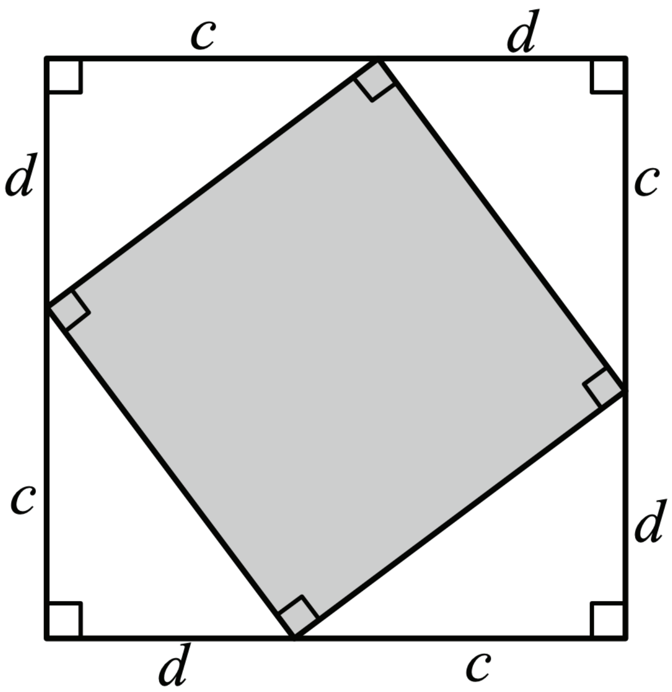
a	
b	

4. Plot these numbers on the number line:

$$\sqrt[3]{9},\ \sqrt{10},\ \sqrt{16},\ \sqrt[3]{27}$$



5. Find values for c and d so that the shaded square has a side length between 6 and 7 centimeters. Explain or show your reasoning.

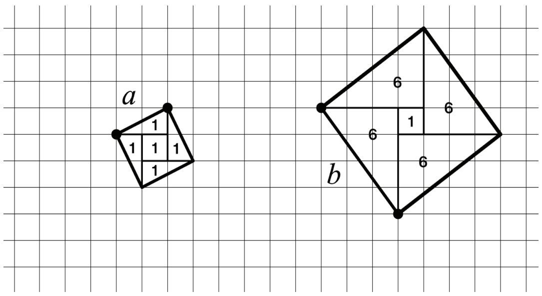


c	
d	

1. B. $z = \sqrt{20}$

2. A. $\sqrt[3]{36}$ inches

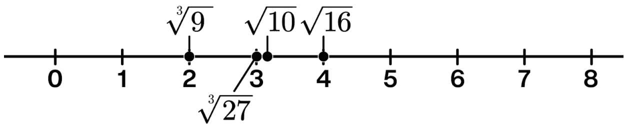
3.



a	$\sqrt{5}$
b	5

Explanations vary. I drew a tilted square using the segment as one side. The area of a tilted square can be divided into four congruent triangles and a square. I calculated the area of one triangle, multiplied that by 4, and then added the area of the square. The segment length is the square root of the area of the tilted square.

4.



5.

c	5 cm
d	4 cm

Explanations vary. With these measurements, the outer square would have sides lengths of 9 cm, making its area 81 square cm. The four triangles have a total area of 40 square cm.

When you subtract the triangle area from the outer square, the shaded square's area is $81 - 40$, or 41 square cm. If the area of the shaded square is 41 square cm, then its side length must be $\sqrt{41}$ cm, which I know is between 6 and 7 cm, since $6^2 = 36$ and $7^2 = 49$.

Unit 8.8, Quiz: Summary and Rubric

Content Standards Summary

Standard	8.EE.A.2	8.NS.A.2
Problems	1, 2, 3, 5	4, 5

Problem 1
(Standard: **8.EE.A.2**)

In this problem, students recognize square roots as solutions to equations of the form $x^2 = n$. This problem corresponds most directly to the work students did in Lesson 4: Root Down.

Suggested Next Steps: If students struggle . . .
- Consider having students approximate the solution first as a number between 4 and 5, then ask students how they can use symbols to represent the exact value.
- Consider revisiting Lesson 4, Activity 1, Screen 3.

Problem 2
(Standards: **8.EE.A.2, MP6**)

In this problem, students understand that a cube root represents the side length of a cube. Students attend to precision when they use the language given in the problem to determine a cube root. This problem corresponds most directly to the work students did in Lesson 5: Filling Cubes.

Suggested Next Steps: If students struggle . . .
- Consider starting students with an example that only involves integers, such as finding the side length of a cube with a volume of 8. Then ask students to name and write down the relationship between 2 and 8, and then express it using radical symbols.
- Consider revisiting Lesson 5, Activity 1.

Unit 8.8, Quiz: Summary and Rubric

Problem 3
(Standards: **8.EE.A.2, MP7**)

In this problem, students use the structure of the grid and square roots to calculate distances. This problem corresponds most directly to the work students did in Lesson 3: Between Squares.

Suggested Next Steps: If students struggle . . .
- Consider having students draw a square using each given segment, then use strategies from Lesson 1, Activity 1, Screen 3 to help them determine the area of each square.
- Consider revisiting Lesson 1, Activity 1 or Lesson 3, Activity 2.

Problem 4
(Standards: **8.NS.A.2, MP7**)

In this problem, students use the structure of the number line to estimate the value of square roots and cube roots. This problem corresponds most directly to the work students did in Lesson 4: Root Down.

Suggested Next Steps: If students struggle . . .
- Consider asking students to look for integer values and plot those first. Then have students use their knowledge of squares and cubes to estimate between which consecutive integers the remaining values are.
- Consider revisiting Lesson 4, Activity 2, Screen 5 or Problems 1 and 6 from Practice Day 1.

Problem 5
(Standards: **8.EE.A.2, 8.NS.A.2, MP1**)

In this problem, students use strategies like “surround and subtract” to solve problems involving areas of tilted squares. This problem corresponds most directly to the work students did in Lesson 1: Tilted Squares.

Suggested Next Steps: If students struggle . . .
- Consider giving students some small starting values for c and d and have them determine the total area of the triangles and the shaded square. Then have them determine the side length of the square and ask how they can adjust their starting values to fit the constraints of the problem.
- Consider revisiting Lesson 1, Activity 1.

Unit 8.8, Quiz: Summary and Rubric

Problem	Standard	Meeting/Exceeding	Approaching	Developing	Beginning	
		4	3	2	1	0
1	8.EE.A.2	Correct choice. • $z = \sqrt{20}$			Incorrect choice. *Students who selected $z = 10$ may have solved $2z = 20$ instead.*	Did not attempt.
2	8.EE.A.2	Correct choice. • $\sqrt[3]{36}$ inches			Incorrect choice. *Students who selected 12 inches may have solved $3s = 36$ instead.*	Did not attempt.
3	8.EE.A.2	**Correct answers** with **correct explanation.** • $a = \sqrt{5}$ *units* • $b = 5$ *units* *E.g., I drew a tilted square using the segment as one side. The area of a tilted square can be divided into four congruent triangles and a square. I calculated the area of one triangle, multiplied that by 4, and then added the area of the square. The segment length is the square root of the area of the tilted square.*	**One or two segments calculated** with **minor flaws in explanation.** *E.g., The length of the segment looks like more than 2 but less than 3 units, so I estimated it to be $\sqrt{5}$ units.*	**One or two segments calculated** with **incomplete explanation.** *E.g., I drew tilted squares and triangles.* **Incorrect answer** with **explanation that shows partial understanding.**	**Incorrect answer** with **no explanation or incorrect explanation.**	Did not attempt.

Unit 8.8, Quiz: Summary and Rubric

Problem	Standard	Meeting/Exceeding	Approaching	Developing	Beginning	
		4	**3**	**2**	**1**	**0**
4	8.NS.A.2	Work is **complete** and **correct**.	Work shows **conceptual understanding** with some errors. *E.g., Student plots both:* • $\sqrt{10}$ *near the middle of* 3 *and* 4 *.* • $\sqrt[3]{9}$ *somewhere in between* 2 *and* 2.5*.*	Work shows **incomplete understanding** with significant errors. *E.g., Student plots either:* • $\sqrt{10}$ *near the middle of* 3 *and* 4 *.* • $\sqrt[3]{9}$ *somewhere in between* 2 *and* 2.5*.*	Work shows **limited understanding** of using the structure of the number line to estimate the value of square roots and cube roots. *E.g., Student correctly plots at least one number.* *Student plots none of the numbers correctly.*	Did not attempt.

Unit 8.8, Quiz: Summary and Rubric

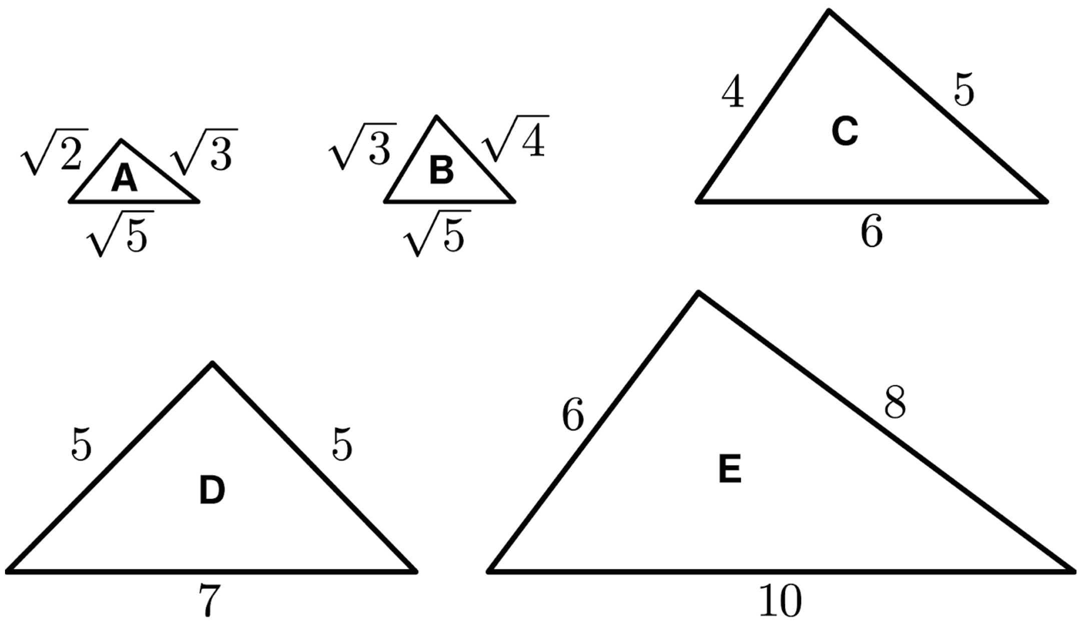
Problem	Standard	Meeting/Exceeding	Approaching	Developing	Beginning	
		4	**3**	**2**	**1**	**0**
5	8.EE.A.2, 8.NS.A.2	**Correct answers** with **correct explanation.** *Side lengths can very as long as* $\sqrt{c^2 + d^2}$ *is between* 6 *and* 7*.* • $c = 5$ *cm* • $d = 4$ *cm* *E.g., With these measurements, the outer square would have sides lengths of* 9 *cm, making its area* 81 *square cm. The four triangles have a total area of* 40 *square cm.* *When you subtract the triangle area from the outer square, the shaded square's area is* $81 - 40$*, or* 41 *square cm. If the area of the shaded square is* 41 *square cm, then its side length must be* $\sqrt{41}$ *cm, which I know is between* 6 *and* 7 *cm, since* $6^2 = 36$ *and* $7^2 = 49$*.*	**One or two segments calculated** with **minor flaws in explanation.** *E.g., Student calculates the area of the outer square and subtracts the area of the triangles but makes a minor calculation error.*	**One or two segments calculated** with **incomplete explanation.** **Incorrect answer** with **explanation that shows partial understanding.** *E.g., Student calculates area and uses the square root in their calculations.*	**Incorrect answer** with **no explanation or incorrect explanation.**	Did not attempt.

Name ______________________

1. Select **all** the numbers that are solutions to the equation $x^3 = 27$.

☐ $\sqrt{27}$ ☐ 3 ☐ $\sqrt[3]{27}$ ☐ 27^3 ☐ 9

2. Circle **all** the right triangles.



3.1 Which of these is equivalent to $0.\overline{13}$?

A. $\frac{1}{3}$ B. $1\frac{1}{3}$ C. $\frac{13}{99}$ D. $\frac{12}{90}$

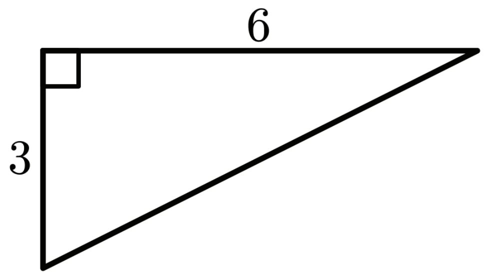
3.2 Which of these describes $0.\overline{13}$?

A. Rational B. Irrational

Explain your thinking.

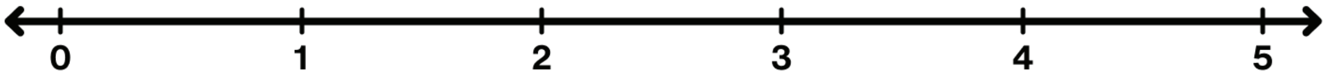
Name ____________________________

4. Calculate the length of the unlabeled side of this right triangle.



5.1 Plot these numbers on the number line:

$\sqrt{2}$ $\sqrt{8}$ $\sqrt[3]{8}$ $\sqrt[3]{28}$ $\sqrt{16}$

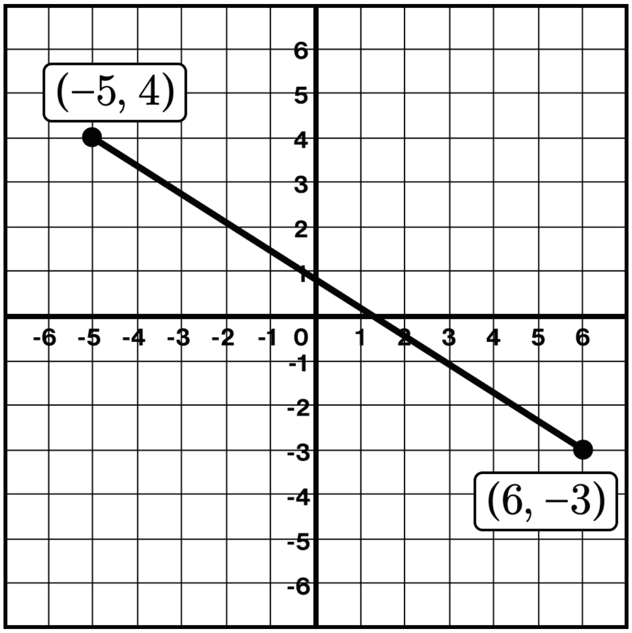


5.2 Kai plotted $\sqrt{8}$ on the number line at 4.

Explain how you know this cannot be the correct position for $\sqrt{8}$ on the number line.

6. How many units long is the line segment between the points $(-5, 4)$ and $(6, -3)$?

   Use the graph if it helps with your thinking.

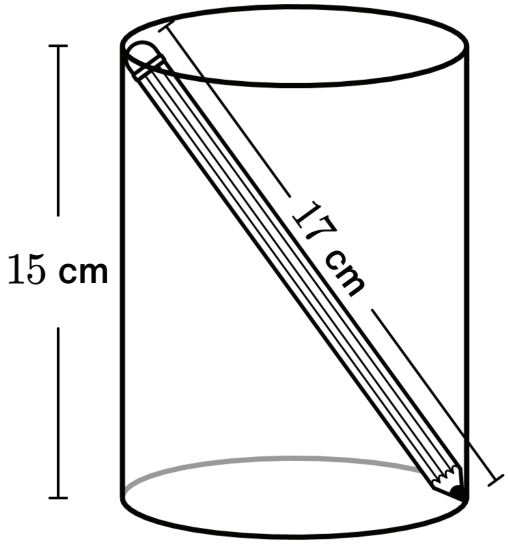


Wey Wey drops a pencil in her cup and notices that it only fits diagonally. The pencil is 17 centimeters long and the cup is 15 centimeters tall.

7.1 What is the diameter of the cup?

Show or explain your thinking.

$$V = \pi r^2 h$$



7.2 What is the volume of the cup?

Show or explain your thinking.

Unit 8.8, End-Unit Assessment: Form A Name ___________________________

Reflection: Select a question to answer.

☐ What is something you are proud of from this unit?

☐ Write what you know about a topic from this unit that you weren't asked about today.

☐ Describe or show one strategy you found helpful in this unit.
Name any students who helped you with this strategy.

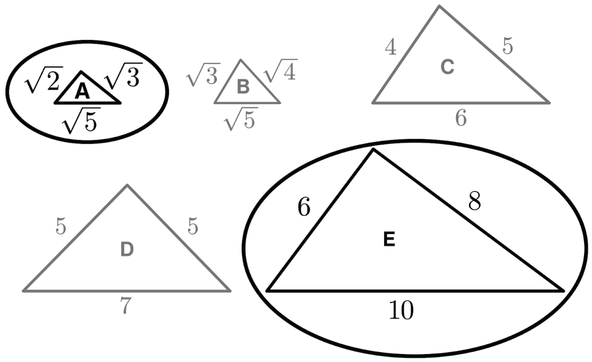
☐ What else would you like your teacher to know?

Unit 8.8, End-Unit Assessment: Form A

Answer Key

1. ✓ 3
   ✓ $\sqrt[3]{27}$

2.

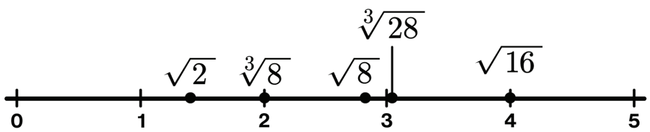


3.1 D. $\frac{12}{90}$

3.2 Rational
Explanations vary. I know this number is rational because I can write it as a fraction.

4. $\sqrt{45}$ units (or equivalent)

5.1



5.2 *Responses vary.* $\sqrt{8}$ cannot equal 4 because 4^2 is 16, not 8.

6. $\sqrt{170}$ units (or equivalent)

7.1 8 centimeters
Explanations vary. The diameter of the cylindrical cup can be found using the Pythagorean theorem: $\sqrt{17^2 - 15^2} = 8$.

7.2 240π cubic cm (or equivalent)
Explanations vary. The diameter of the cylinder is 8 cm. That means the radius is 4 cm. The volume of the cylinder is $\pi \cdot 4^2 \cdot 15 = 240\pi$.

Unit 8.8, End Assessment Summary and Rubric: Form A

Content Standards Summary

Standard	8.EE.A.2	8.G.B.6	8.G.B.7	8.G.B.8	8.G.C.9	8.NS.A.1	8.NS.A.2
Problems	1, 5	2	4, 7.1	6	7.2	3	5

Problem 1

(Standard: **8.EE.A.2**)

In this problem, students identify the value of a cube root. This problem corresponds most directly to the work students did in Lesson 5: Filling Cubes.

Suggested Next Steps: If students struggle . . .

- Consider having students substitute the given values into the equation to first determine if their answers are reasonable. Then ask students to pick out exact solutions from the generated list of reasonable solutions.
- Consider revisiting Lesson 5, Activity 2, Screen 9.

Problem 2

(Standards: **8.G.B.6, MP6**)

In this problem, students attend to precision when they determine whether each triangle satisfies the Pythagorean theorem. This problem corresponds most directly to the work students did in Lesson 9: Make It Right.

Suggested Next Steps: If students struggle . . .

- Consider reminding students of the Pythagorean Theorem and its converse, then ask how they could apply these theorems to test each triangle.
- Consider revisiting Lesson 9, Activity 1.

Problem 3

(Standards: **8.NS.A.1, MP6**)

In this problem, students express a repeating decimal as a fraction and describe it as rational or irrational. Students use precise language when they identify the decimal as rational or irrational. This problem corresponds most directly to the work students did in Lesson 13: Decimals to Fractions and Lesson 14: Hit the Target.

Suggested Next Steps: If students struggle . . .

- Consider reminding students how to convert fractions to decimals using long division.
- Consider revisiting Lesson 13, Activity 1, Screen 5.

Problem 4

(Standard: **8.G.B.7**)

In this problem, students apply the Pythagorean theorem to determine an unknown side length. This problem corresponds most directly to the work students did in Lesson 8: Triangle-Tracing Turtle.

Suggested Next Steps: If students struggle . . .

- Consider having students identify the type of triangle (right), then ask if they know any previous results that can help them make sense of right triangles.
- Consider revisiting Lesson 8, Activity 2.

Problem 5
(Standards: **8.EE.A.2, 8.NS.A.2, MP3, MP7**)

In this problem, students use the structure of the number line to locate approximate square and cube roots and estimate their value. Students also critique the reasoning of another to explain why a certain value has been misidentified. This problem corresponds most directly to the work students did in Lesson 4: Root Down.

Suggested Next Steps: If students struggle . . .
- Consider reminding students of the perfect squares and perfect cubes, then ask students to identify between which two consecutive integers each value must lie.
- Consider revisiting the Lesson Synthesis of Lesson 4.

Problem 6
(Standards: **8.G.B.8, MP7**)

In this problem, students use the structure of the coordinate grid and apply the Pythagorean theorem to calculate the distance between two points. This problem corresponds most directly to the work students did in Lesson 11: Pond Hopper.

Suggested Next Steps: If students struggle . . .
- Consider helping students draw and label an appropriate right triangle, then ask how they can use the structure of the triangle and the grid to determine the missing side length.
- Consider revisiting Lesson 11, Activity 1.

Unit 8.8, End Assessment Summary and Rubric: Form A

Problem 7

(Standards: **8.G.B.7, 8.G.C.9, MP2**)

In this problem, students apply the Pythagorean theorem in a volume context. Students reason abstractly and quantitatively when they decide how to represent and apply each dimension of the cup in context. This problem corresponds most directly to the work students did in Lesson 10: Taco Truck.

Suggested Next Steps: If students struggle . . .

- Consider asking students to annotate the diagram with an angle measure and represent the pencil as a line segment. In part two, consider reminding students of the relationship between the diameter and radius.
- Consider revisiting Lesson 10, Activity 1, Screen 5.

Unit 8.8, End Assessment Summary and Rubric: Form A

Problem	Standard	Meeting/Exceeding	Approaching	Developing	Beginning	
		4	**3**	**2**	**1**	**0**
1	8.EE.A.2	Student selects all of the correct choices and does not select any incorrect choices. • 3 • $\sqrt[3]{27}$	Student selects one of the correct choices and does not select any incorrect choices. Student selects both of the correct choices and one incorrect choice.	Student selects one of the correct choices and one incorrect choice.	Student only selects incorrect choices. Student selects two or more incorrect choices with the correct choices.	Did not attempt.
2	8.G.B.6, MP6	Student selects all of the correct choices and does not select any incorrect choices. • A • E	Student selects one of the correct choices and does not select any incorrect choices. Student selects both of the correct choices and one incorrect choice.	Student selects one of the correct choices and one incorrect choice.	Student only selects incorrect choices. Student selects two or more incorrect choices with the correct choices.	Did not attempt.
3.1	8.NS.A.1	• $\frac{12}{90}$			• Students who select $\frac{1}{3}$ may have remembered that there is a repeating 3 in its decimal expansion. • Students who select $\frac{13}{99}$ may have confused the decimal equivalent of $0.\overline{13}$ and $0.1\overline{3}$.	Did not attempt.

Unit 8.8, End Assessment Summary and Rubric: Form A

Problem	Standard	Meeting/Exceeding	Approaching	Developing	Beginning	
		4	3	2	1	0
3.2	8.NS.A.1, MP6	Student successfully answers the question and includes a logical and complete explanation. • Rational I know this number is rational because I can write it as a fraction.	Correct answer with minor flaws in explanation. Incorrect answer with logical and complete explanation. • Students who select “Irrational” but then correctly explain that it can be written as a fraction may have confused the terms.	Correct answer with incomplete explanation. Incorrect answer with explanation that communicates partial understanding of the situation.	Incorrect answer with incorrect explanation or without an explanation.	
4	8.G.B.7	Work is complete and correct. • $\sqrt{45}$ units	Work shows conceptual understanding and mastery, with some errors. • Students who write 45 may have correctly substituted the leg lengths into the Pythagorean theorem but did not account for the exponent on c^2 when solving.	Work shows a developing but incomplete conceptual understanding, with significant errors. • Students who write 9 or $\sqrt{9}$ may have added the leg lengths without squaring them first.	• Weak evidence of understanding how to apply the Pythagorean theorem.	Did not attempt.

Unit 8.8, End Assessment Summary and Rubric: Form A

Problem	Standard	Meeting/Exceeding	Approaching	Developing	Beginning	
		4	3	2	1	0
5.1	8.EE.A.2, 8.NS.A.2, MP7	Work is complete and correct.	Work shows conceptual understanding and mastery, with minor errors. • Student correctly locates four of the five values on the number line.	Work shows a developing but incomplete conceptual understanding, with significant errors. • Student correctly locates two or three of the five values on the number line.	Weak evidence of understanding. • Student correctly locates one of the five values on the number line.	Did not attempt.
5.2	8.EE.A.2, 8.NS.A.2, MP3	Work is complete and correct. • $\sqrt{8}$ cannot equal 4 because 4^2 is 16, and not 8.	Work shows conceptual understanding and mastery, with minor errors. Minor calculation error in calculating 4^2.	Work shows a developing but incomplete conceptual understanding, with significant errors. Response does not compare 4^2 to $\sqrt{8}$.	Weak evidence of understanding.	Did not attempt.
6	8.G.B.8, MP7	Work is complete and correct. • $\sqrt{170}$ units (or equivalent)	Work shows conceptual understanding and mastery, with some errors. • Students who write $\sqrt{72}$ may have calculated $\sqrt{11^2 - 7^2}$ instead of $\sqrt{11^2 + 7^2}$.	Work shows a developing but incomplete conceptual understanding, with significant errors.	Weak evidence of understanding how to calculate distance in the coordinate plane. • Students who write 15 or 16 may have counted the number of square units that the line intersects on the grid.	Did not attempt.

Unit 8.8, End Assessment Summary and Rubric: Form A

Problem	Standard	Meeting/Exceeding	Approaching	Developing	Beginning	
		4	**3**	**2**	**1**	**0**
7.1	8.G.B.7, MP2	Student successfully answers the question and includes a logical and complete explanation. • 8 centimeters The diameter of the cylindrical cup can be found using the Pythagorean theorem: $\sqrt{17^2 - 15^2} = 8$.	Correct answer with minor flaws in explanation. Incorrect answer with logical and complete explanation.	Correct answer with incomplete explanation. Incorrect answer with explanation that communicates partial understanding of the situation. • Students who write that the diameter or radius of the cup is 22.7 cm may have used 17 and 15 as the legs of a right triangle.	Incorrect answer with incorrect explanation or without an explanation.	Did not attempt.
7.2	8.G.C.9, MP2	Student successfully answers the question and includes a logical and complete explanation. • 240π cubic cm The diameter of the cylinder is 8 cm. That means the radius is 4 cm. The volume of the cylinder is $\pi \cdot 4^2 \cdot 15 = 240\pi$.	Correct answer with minor flaws in explanation. Incorrect answer with logical and complete explanation. • Students who write 960π cubic cm may have used the diameter of the cup instead of the radius to calculate its volume.	Correct answer with incomplete explanation. Incorrect answer with explanation that communicates partial understanding of the situation. • Students who write that the cup can hold 8 cubic cm of water correctly calculated the diameter of the cup.	Incorrect answer with incorrect explanation or without an explanation.	Did not attempt.

GRADE 8

Exit Tickets

Exit Tickets provide an opportunity for students to show what they individually understood about the main idea of the lesson.

This section includes all Exit Tickets and Teacher Moves for Units 1–8, as well as printable PDFs for sample lessons. Please note that Exit Tickets are referenced as Cool Downs in this review.

Exit Tickets are available as PDFs for download from the teacher experience in the platform, as well as digitally in the student experience. Amplify Desmos Math does not include them in the core student print materials to ensure students do not have access prior to the end of the lesson. (Teachers can control access to the Exit Ticket in the digital experience, too.)

Name: .... Date: .... Period: ....

Exit Ticket 4.04

Nyanna solved the equation $8(x-3)+7=2x(4-17)$ incorrectly. Her work is shown.

$$8(x-3)+7=2x(4-17)$$
$$8(x-3)+7=2x(13)$$
$$8x-24+7=26x$$
$$8x-17=26x$$
$$-17=34x$$
$$-\frac{1}{2}=x$$

1. Determine Nyanna's error.

2. Determine the correct solution to the equation.

How well did you understand the math in this lesson?

1 2 3 4 5

How did you feel about this lesson?

1 2 3 4 5

Reflect on the math from this lesson.

- I can solve a linear equation.
- I can analyze strategies for solving a linear equation.

Lesson 4 More Balanced Moves

Exit Ticket PDFs are available for all lessons. Here are samples from Amplify Desmos Math New York, fully designed.

Name: ________ Date: ________ Period: ________

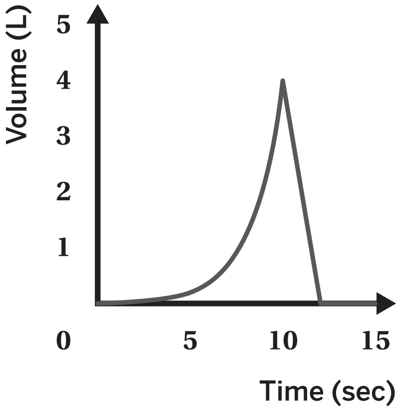
Exit Ticket

5.06

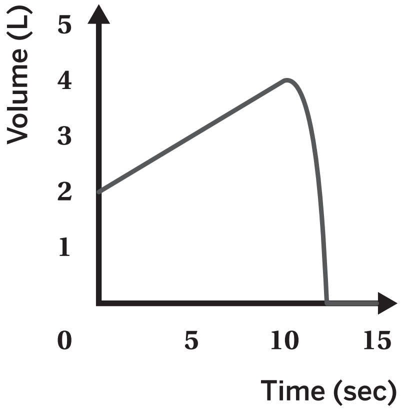
A bucket is half full of water. Hoang fills the rest of the bucket at a constant rate. Once the bucket is full, Hoang pours the water over his head — starting slowly, then speeding up until the bucket is empty.

Which graph could represent the relationship between the volume of water in the bucket and time? Explain your thinking.

Graph A



Graph B



How well did you understand the math in this lesson?

How did you feel about this lesson?

Reflect on the math from this lesson.

- I can draw the graph of a function that represents a real-world situation.
- I can describe where the graph of a function is *increasing*, *decreasing*, *linear*, or *non-linear*.

The following pages in this section include digital versions of all Exit Tickets and their Teacher Moves for Units 1–8.

Please note that Exit Tickets are referenced as Cool Downs in the partially designed samples that follow.

8.1 Cool-Downs

Lesson Checklist

- ☐ Complete the lesson using the student preview.
- ☐ Identify how this lesson extends the learning from previous lessons, and how it prepares students for future lessons.
- ☐ Think about how you will introduce each new section within the lesson to engage students in the task and maintain focus on the learning goals.
- ☐ Determine the screens where you'll use Pacing and Pause to bring the class together. What questions will you ask on those screens?
- ☐ Anticipate screens where students will struggle, then plan your response.
- ☐ Consider how to use snapshots to select and present student thinking for class discussion.
- ☐ Think about how you will use the results of previous Cool-Downs and student surveys to inform your approach to this lesson.

1 Lesson 1: Describing Movemen...

Marcela saw a transformer and described the shape before (gray) and after (red) like this:

Marcela saw a transformer and described the shape before (gray) and after (red) like this:

"The shape turned and then moved down and to the right."

Which transformer do you think Marcela was describing?

Teacher Moves

Support for Future Learning
Students will have more opportunities to describe transformations more formally, so if students struggle with this cool-down, there is no need to slow down or add additional work to the next lessons.

Early Student Thinking
Later in Unit 1, students will be introduced to the formal language of transformations (i.e., *translations*, *reflections*, and *rotations*). The purpose of this lesson is for students to describe these movements using everyday language. Because of this, it is possible that students may interpret a “turn” as either a rotation or a reflection, so there are two possible correct responses for this problem.

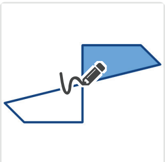
Sample Responses

Responses vary.

Top left or bottom left

---

2 Lesson 2: Naming Transforma...



What type of move takes the blue

What type of move takes the blue polygon to the white polygon?

Use the sketch tool if it helps you to show your thinking.

Teacher Moves

Support for Future Learning
If students struggle with distinguishing between reflection, rotation, and translation, plan to revisit this when opportunities arise over the next several lessons. Consider spending extra time on Lesson 3’s warm-up to discuss how each of the three transformations would affect the shape.

Sample Responses

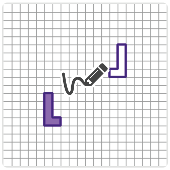
Rotation

Responses vary.

If the blue polygon is rotated around the point shared by both polygons, it will land on the white polygon.

---

3 Lesson 3: Sequences of Transf...



This challenge can be solved using . . .

This challenge can be solved using . . .

Teacher Moves

Support for Future Learning
Students will have more opportunities to describe transformations, so if students struggle with this cool-down, there is no need to slow down or add additional work to the next lessons.

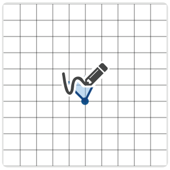
Sample Responses

This challenge can be solved using . . .

- . . . only reflections.
- . . . a reflection and a translation.

---

4 Lesson 4: Transformations on ...



Triangle ABC is drawn on a grid.

Using the sketch tool, draw and ...

Triangle ABC is drawn on a grid.

Using the sketch tool, draw and label:

1. A reflection of triangle ABC.
2. A translation of triangle ABC.
3. A rotation of triangle ABC.

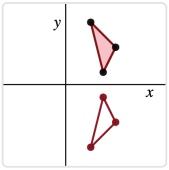
Teacher Moves

Support for Future Learning
If students struggle to perform each transformation, consider reviewing this cool-down as a class before Lesson 5 or offering individual support where needed during the next lesson.

Sample Responses

Image solution

5 Lesson 5: Using Coordinates t...



The pre-image (shaded) is reflected across the x-axis to create the image (unshaded)

The pre-image (shaded) is reflected across the x-axis to create the image (unshaded).

Enter the missing coordinates.

Teacher Moves

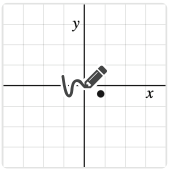
Support for Future Learning
If students struggle with identifying the coordinates, plan to revisit this when opportunities arise in Lesson 6. Consider asking students to identify the coordinates of the points in the pre-image and image on Screen 4 and connecting what they notice to the type of transformation.

Sample Responses

Clockwise from the top of the outlined image:

$(3, -1)$
$(4, -3)$
$(2, -5)$

6 Lesson 6: Describing Transfor...



Point A is located at $(2, -1)$.

Point A is located at $(2, -1)$.

Complete the table.

Use the sketch tool if it helps you with your thinking.

Teacher Moves

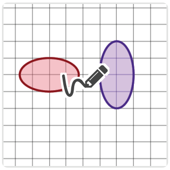
Support for Future Learning
If students struggle to identify the coordinate after the transformation, consider reviewing this problem as a class before the quiz.

Sample Responses

Point B: $(4, -1)$
Point C: $(-2, -1)$
Point D: $(-2, 1)$

---

7 Lesson 7: Defining Congruence



Are figures A and B congruent?

Are figures A and B congruent?

Use the sketch tool if it helps you with your thinking.

Teacher Moves

Support for Future Learning
Students will have more opportunities to understand how to determine whether shapes are congruent, so if students struggle with this cool-down, there is no need to slow down or add additional work to the next lessons.

Sample Responses

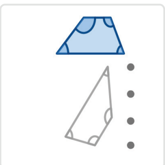
No

Responses vary.

The figures are not congruent because they do not have the same length and width. Figure B is 2 units wide by 3 units long, and figure A is about 3.5 units wide by 2 units long.

---

8 Lesson 8: Rigid Transformations



Trapezoid B is the image of trapezoid A under a series of rigid transformation

Trapezoid B is the image of trapezoid A under a series of rigid transformations.

Use the information in trapezoid A to label the measurements of the corresponding parts in trapezoid B.

Teacher Moves

Support for Future Learning
If students struggle with identifying corresponding sides and angles, plan to revisit this when opportunities arise in Lesson 9.

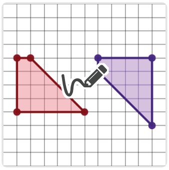
Consider pausing on Screen 3 to discuss pairs of corresponding sides and what students know about the angle measures of $JKLM$.

Sample Responses

Image solution

---

9 Lesson 9: Rigid Transformatio...



Describe a sequence of transformation

Describe a sequence of transformations to convince a classmate that quadrilateral $ABCD$ is congruent to quadrilateral $EFGH$.

Teacher Moves

Support for Future Learning
If students struggle to describe a series of transformations, consider reviewing this screen as a class or offering individual support where needed during the Practice Day.

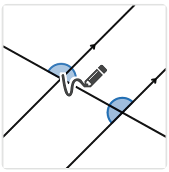
Sample Responses

Responses vary.

- Translate $ABCD$ down 1 and 5 to the right. Then reflect over GH.
- Translate $EFGH$ up 1 and 5 to the left. Then reflect over DC.

---

10 Lesson 10: Angle Measures in...



Xavier says that the information

Xavier says that the information given is enough to determine the measures of angle C and angle D.

Which angle measures can Xavier actually determine?

Use the sketch tool if it helps you with your thinking.

Teacher Moves

Support for Future Learning
Students will have more opportunities to identify congruent angles, so there is no need to slow down or add additional work to the next lessons.

Sample Responses

Both

Responses vary.

Xavier can know the measurements of both C and D. You can use a rotation to transform the $74°$ angle onto angle C. You can use a translation to transform the $106°$ angle onto angle D.

---

11 Lesson 11: Angle Sums in Tria...

Select three angle measures that could be angles in the same triangle.

Select three angle measures that could be angles in the same triangle.

Teacher Moves

Support for Future Learning
Students will have more opportunities to understand the angle measures in a triangle, so if students struggle with this cool-down, there is no need to slow down or add additional work to the next lessons.

Sample Responses

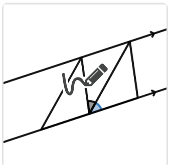
$42°$, $18°$, $120°$

Responses vary.

I know these could be the angles in a triangle because $42°$, $18°$, and $120°$ sum to $180°$.

---

12 Lesson 12: Proving the Triangl...



AB is parallel to DE.

f(x)

AB is parallel to DE.

What is the measure of angle CAB?

Use the sketch tool if it helps you with your thinking.

Teacher Moves

Support for Future Learning
If students struggle to calculate the measure of the missing angle, consider making time to explicitly revisit these ideas before the End-

Unit Assessment.

Facilitation
Consider allowing students to use paper and pencil to record their ideas in addition to using the sketch tool.

Sample Responses

$100°$

Responses vary.

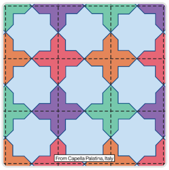
$ACE = 180° - (37° + 43°) = 100°$. CAB and ACE are congruent (alternate interior angles), so $CAB = 100°$.

Student Supports

Students With Disabilities
• *Visual-Spatial Processing: Visual Aids*
Provide printed copies of the representations for students to draw on or highlight.

---

13 Lesson 13: Using Transformat...



Tyani drew the center square

Tyani drew the center square (square A), then used transformations to create a tessellation.

Describe how square A could have been transformed to create square B.

Teacher Moves

Support for Future Learning
If students struggle to describe transformations used to create a tessellation, consider making time to revisit these ideas before the End-Unit Assessment.

Sample Responses

Responses vary.

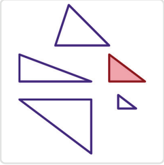
To create Square B, you can reflect Square A horizontally across its right edge.

8.2 Cool-Downs

Lesson Checklist

- ☐ Complete the lesson using the student preview.
- ☐ Identify how this lesson extends the learning from previous lessons, and how it prepares students for future lessons.
- ☐ Think about how you will introduce each new section within the lesson to engage students in the task and maintain focus on the learning goals.
- ☐ Determine the screens where you'll use Pacing and Pause to bring the class together. What questions will you ask on those screens?
- ☐ Anticipate screens where students will struggle, then plan your response.
- ☐ Consider how to use snapshots to select and present student thinking for class discussion.
- ☐ Think about how you will use the results of previous Cool-Downs and student surveys to inform your approach to this lesson.

1 Lesson 1: Exploring Dilations a...



Click on the figures that you think are similar to figure A.

Click on the figures that you think are similar to figure A.

Teacher Moves

Support for Future Learning
Students will have more opportunities to identify similar figures, so if students struggle with this cool-down, there is no need to slow down or add additional work to the next lessons.

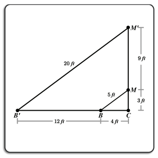
Early Student Thinking
Recall from Screen 7 that while figure A is technically similar to itself, we haven't included it as an answer choice in this introductory lesson. Similarity will be explored in more depth later in Unit 2.

Sample Responses

- Bottom right
- Bottom left

---

2 Lesson 2: Dilations With No Grid



Segment BM is dilated using C as the

Segment BM is dilated using C as the center of dilation.

What is the scale factor?

Teacher Moves

Support for Future Learning
Students will have more opportunities to work with scale factors, so if students struggle with this cool-down, there is no need to slow down or add additional work to the next lessons.

Sample Responses

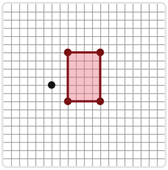
4

Responses vary.

- The scale factor is 4 because the distance between C and M' is 4 times the distance between C and M.

• The scale factor is 4 because BM is 5 ft. and $B'M'$ is 20 ft. since $5 \cdot 4 = 20$.

3 Lesson 3: Dilations on a Squar...



Rectangle $WXYZ$ is dilated using center P and a scale factor of $\frac{1}{2}$.

Rectangle $WXYZ$ is dilated using center P and a scale factor of $\frac{1}{2}$.

Drag the movable points to indicate the location of the image.

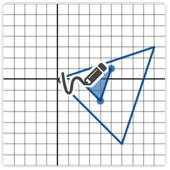
Teacher Moves

Support for Future Learning
If students struggle with performing the dilation, plan to revisit this when opportunities arise during Lesson 4. Consider spending extra time discussing the dilations in Lesson 4, Activity 1.

Sample Responses

Image solution

4 Lesson 4: Dilations With Coor...



The smaller triangle is dilated to

The smaller triangle is dilated to create the larger triangle. The center of dilation is plotted but not labeled.

Describe this dilation. Be sure to include all of the information someone would need to perform the dilation.

Teacher Moves

Support for Future Learning
If students struggle to describe the dilations, consider making time to explicitly revisit these ideas before the quiz.

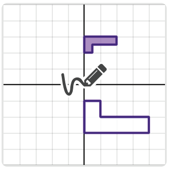
Sample Responses

Responses vary.

Information that must be included:
- The center of dilation is $(3,0)$.
- The scale factor is 3.
- The triangle being dilated has vertices at $(2,0)$, $(4,2)$, and $(5,1)$.

---

5 Lesson 5: Dilations and Simila...



The figures shown are similar.

The figures shown are similar.

Describe a sequence of transformations that takes the shaded figure to the outlined figure.

Use the sketch tool if it helps you with your thinking.

Teacher Moves

Support for Future Learning
If students struggle to describe a sequence of transformations, plan to revisit this when opportunities arise during the next several lessons. Consider making explicit connections to transformations in Lesson 7, Activity 1.

Sample Responses

Responses vary.

• Reflect across the x-axis. Then dilate with center $(0, -6)$ and a scale factor of 2.
• Dilate with center $(0, 6)$ and a scale factor of 2. Then reflect across the x-axis.

---

6 Lesson 6: Similar Polygons

Is $ABCD$ similar to $EFGH$?

Is $ABCD$ similar to $EFGH$?

Teacher Moves

Support for Future Learning
Students will have more opportunities to determine whether or not two figures are similar, so if students struggle with this cool-down, there is no need to slow down or add additional work to the next lessons.

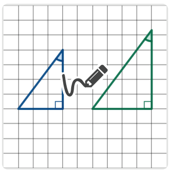
Sample Responses

Yes, $ABCD$ is similar to $EFGH$.

Responses vary.
• Corresponding angles are congruent, and there is a common scale factor $\left(\frac{4}{3}\right)$ between corresponding sides.
• Dilating quadrilateral $ABCD$ with center A and a scale factor $\frac{3}{4}$ of gives a quadrilateral that is congruent to $EFGH$. This can be shown with a translation of A to E and then a rotation with center E.

---

7 Lesson 7: Similar Triangles



Here are two triangles.

Here are two triangles.

Are they similar?

Use the sketch tool if it helps you with your thinking.

Teacher Moves

Support for Future Learning

If students struggle to use angles to determine if two triangles are similar, consider making time to explicitly revisit these ideas before the quiz.

Sample Responses

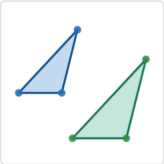
Similar

Responses vary.

These triangles are similar because all three pairs of corresponding angles are congruent.

---

8 Lesson 8: Side Length Quotien...



Triangles ABC and DEF are similar.

Triangles ABC and DEF are similar.

Enter the missing values.

Then explain your reasoning.

Teacher Moves

Support for Future Learning
If students struggle to identify the coordinate after the transformation, consider reviewing this problem as a class before the quiz.

Sample Responses

$AC = 8$, $EF = 7.5$

Responses vary.

I saw in triangle DEF that the longest side was double the shortest side, so AC had to be 8. Then I saw in triangle ABC that the medium-length side was 1.5 times the shortest side, so EF had to be 7.5.

9 Lesson 9: Slope of Lines

What is the slope of line k?

$f(x)$

What is the slope of line k?

Teacher Moves

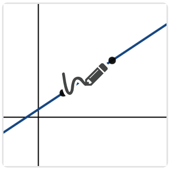
Support for Future Learning
If students struggle to identify the slope, plan to revisit this when opportunities arise during Lesson 10. Consider spending extra time during the warm-up discussing the slope of the line.

Sample Responses

$\frac{3}{2}$ (or equivalent)

---

10 Lesson 10: Slope and Coordi...



Select all the points that are on line m.

Select all the points that are on line m.

Use the sketch tool if it helps you with your thinking.

Teacher Moves

Support for Future Learning
If students struggle to identify other points on the line, consider making time to explicitly revisit these ideas before the End-Unit Assessment or spend extra time on Problem 7 of the Practice Day.

Sample Responses

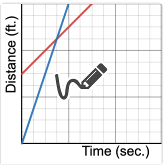
$(6, 5)$
$(12, 9)$
$(18, 13)$

8.3 Cool-Downs

Lesson Checklist

- [ ] Complete the lesson using the student preview.
- [ ] Identify how this lesson extends the learning from previous lessons, and how it prepares students for future lessons.
- [ ] Think about how you will introduce each new section within the lesson to engage students in the task and maintain focus on the learning goals.
- [ ] Determine the screens where you'll use Pacing and Pause to bring the class together. What questions will you ask on those screens?
- [ ] Anticipate screens where students will struggle, then plan your response.
- [ ] Consider how to use snapshots to select and present student thinking for class discussion.
- [ ] Think about how you will use the results of previous Cool-Downs and student surveys to inform your approach to this lesson.

1 Lesson 1: Understan…



This graph shows the distance vs.

This graph shows the distance vs. time relationship for the Lane 1 and Lane 2 turtles. Here are their equations:

Lane 1: $d = 6 + 1t$

Lane 2: $d = 3t$

Select **all** of the true statements.

Teacher Moves

Support for Future Learning

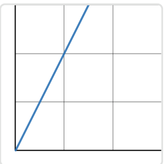
Students will have more opportunities to analyze graphs of linear equations, so if students struggle with this cool-down, there is no need to slow down or add additional work to the next lessons.

Sample Responses

- The Lane 2 turtle is faster than the Lane 1 turtle.
- The Lane 1 turtle has a head start.

---

2 Lesson 2: Graphs of …



Consider the proportional relationship on

Consider the proportional relationship on the left.

Which of the graphs below show the same relationship?

Teacher Moves

Support for Future Learning

If students struggle to identify equivalent scales, plan to revisit this when opportunities arise over the next several lessons. Consider spending extra time during the warm-up of Lesson 3 discussing possible scales for the axes.

Sample Responses

The original graph shows the relationship $y = \frac{1}{2}x$. The top-left and bottom-right graphs show this same relationship.

---

3 Lesson 3: Comparing…

Two seeds were planted and their

Two seeds were planted and their heights were measured each day.

Plant A's data was recorded in a table, while Plant B's data is in a graph.

Which plant grew at a faster rate?

Teacher Moves

Support for Future Learning
If students struggle to determine the rates of change, plan to revisit this when opportunities arise over the next several lessons. Consider focusing Lesson 4's lesson synthesis discussion on the slope of the line.

Sample Responses

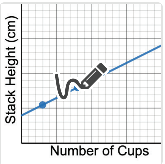
Plant B

Responses vary.

The point $(5, 15)$ is on Plant B's graph, so Plant B's growth rate is 3 centimeters per day. From the table, you can calculate the unit rate for Plant A, $3 \div 2 = 1.5$, and see that it is a slower rate than Plant B.

---

4 Lesson 4: Introductio…



This graph displays the height of the

$f(x)$

This graph displays the height of the stack in centimeters for different numbers of cups.

How much does each cup after the first add to the height of the stack?

Teacher Moves

Support for Future Learning
If students struggle to determine the slope of the line, plan to revisit this when opportunities arise over the next several lessons. Consider spending extra time during Lesson 5's warm-up discussing the slope of the line representing the purple flag's height.

Sample Responses

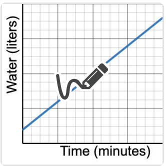
0.5 cm (or equivalent)

Responses vary.

The line passes through $(3, 5.5)$ and $(8, 8)$, which means that adding 5 cups added 2.5 centimeters to the stack. So each cup adds

$\frac{2.5}{5} = 0.5$ centimeters.

5 Lesson 5: Represent…



A bucket is filling with water.

A bucket is filling with water.

The graph shows the relationship between water in the bucket, w, and time, t.

What does the 10 in the equation mean in this scenario?

Use the sketch tool if it helps you with your thinking.

Teacher Moves

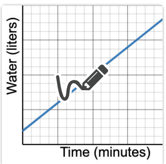
Support for Future Learning
If students struggle to describe the meaning of the slope in context, plan to revisit this when opportunities arise over the next several lessons. Consider spending extra time on Screen 6 of Lesson 7 discussing the meaning of 8 in the expression $640 - 8x$.

Sample Responses

Responses vary.

10 is the vertical intercept. When the pouring began, there were 10 liters of water in the bucket.

6 Lesson 5: Represent…



A bucket is filling with water.

A bucket is filling with water.

The graph shows the relationship between water in the bucket, w, and time, t.

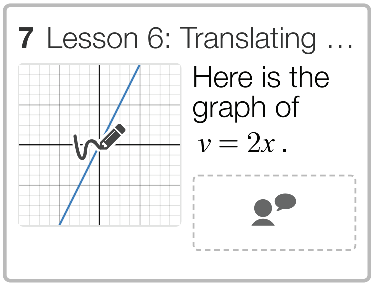
What does the 2 in the equation mean in this scenario?

Use the sketch tool if it helps you with your thinking.

Sample Responses

Responses vary.

2 is the slope (i.e., speed). Water is pouring into the bucket at 2 liters per minute.



Here is the graph of $y = 2x$.

How will the graph of $y = 2x - 7$ look the same and different?

Use the sketch tool if it helps you with your thinking.

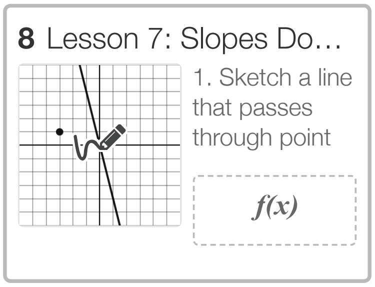
Teacher Moves

Support for Future Learning
Students will have more opportunities to analyze graphs of linear equations, so if students struggle with this cool-down, there is no need to slow down or add additional work to the next lessons.

Sample Responses

Responses vary.

- Both graphs are the same because they both have a slope of 2.
- The graphs are different because $y = 2x - 7$ is shifted down 7 units from $y = 2x$.



1. Sketch a line that passes through point P and has a slope of -2.

2. What is the slope of line l?

Teacher Moves

Support for Future Learning
If students struggle to sketch a graph with a specific negative slope, plan to revisit this when opportunities arise over the next several lessons. Consider spending extra time on Screen 2's card sort discussing students' strategies for deciding the sign of the slope.

Sample Responses

1. A line through the indicated point with a slope of -2.
2. -4

9 Lesson 8: Calculating…

Determine the slope of the line that goes through the points in the table.

Determine the slope of the line that goes through the points in the table.

Teacher Moves

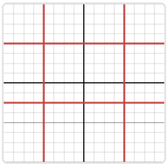
Support for Future Learning
If students struggle with calculating the slope between two points, consider making time to explicitly revisit these ideas before the quiz.

Sample Responses

$\frac{3}{8}$

---

10 Lesson 9: Equations…



Here are four lines on a coordinate grid.

Here are four lines on a coordinate grid.

Write an equation for each line.

Teacher Moves

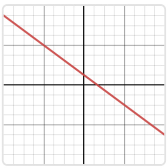
Support for Future Learning
If students struggle with writing an equation for a line, consider making time to explicitly revisit these ideas before the quiz.

Sample Responses

- **Line** a**:** $x = -4$
- **Line** b**:** $x = 4$
- **Line** c**:** $y = 4$
- **Line** d**:** $y = -2$

---

11 Lesson 9: Equations…



Here is a line on a coordinate grid.

Here is a line on a coordinate grid.

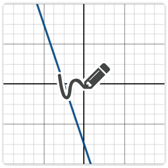
Write an equation for the line.

Sample Responses

Line g**:** $y = -\frac{3}{4}x + 1$ (or equivalent)

---

12 Lesson 10: Solution…



The graph shows the line

The graph shows the line $y = -3x - 6$.

Complete the table so it includes two solutions to the equation.

Teacher Moves

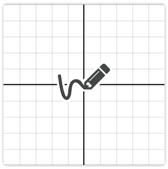
Support for Future Learning
If students struggle to identify solutions from a graph, plan to revisit this when opportunities arise over the next lesson. Consider spending extra time identifying other solutions to the equation on Screen 5 of Lesson 11.

Sample Responses

- When $x = 0$, $y = -6$.
- When $y = -15$, $x = 3$.

---

13 Lesson 11: Using Li…



The graph of a linear equation

The graph of a linear equation passes through the points $(-2, 0)$ and $(0, 6)$.

Is $3x - y = -6$ an equation for this graph?

Teacher Moves

Support for Future Learning
If students struggle with identifying solutions to an equation not in $y = mx + b$ form, consider making time to explicitly revisit these ideas before the End-Unit Assessment.

Sample Responses

Yes.

Explanations vary.

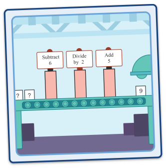
- The points $(-2, 0)$ and $(0, 6)$ both make the equation $3x - y = -6$ true.
- The graph of $3x - y = -6$ goes through both the points.

8.4 Cool-Downs

Lesson Checklist

- [ ] Complete the lesson using the student preview.
- [ ] Identify how this lesson extends the learning from previous lessons, and how it prepares students for future lessons.
- [ ] Think about how you will introduce each new section within the lesson to engage students in the task and maintain focus on the learning goals.
- [ ] Determine the screens where you'll use Pacing and Pause to bring the class together. What questions will you ask on those screens?
- [ ] Anticipate screens where students will struggle, then plan your response.
- [ ] Consider how to use snapshots to select and present student thinking for class discussion.
- [ ] Think about how you will use the results of previous Cool-Downs and student surveys to inform your approach to this lesson.

1 Lesson 1: Solving Nu…



Gabriella put a number into this machine,

f(x)

Gabriella put a number into this machine, and 9 came out.

What number did Gabriella put in?

Teacher Moves

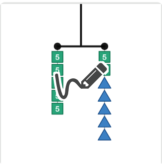
Support for Future Learning
Students will have more opportunities to work on multistep equations, so if students struggle with this cool-down, there is no need to slow down or add additional work to the next lessons.

Sample Responses

14

---

2 Lesson 2: Keeping th…



Here is a new balanced hanger.

f(x)

Here is a new balanced hanger.

In this hanger, each square weighs 5 pounds.

What is the weight of a triangle?

Use the sketch tool if it helps you with your thinking.

Teacher Moves

Support for Future Learning
If students struggle with naming moves, consider spending extra time on Lesson 3's warm-up to reflect on and review the types of hanger diagram moves that keep the hanger balanced.

Sample Responses

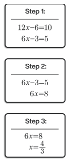
3

Responses vary.

I took two squares off each side and saw that 15 on the left is balanced with 5 triangles on the right. This means that each triangle must weigh 3 pounds.

---

3 Lesson 3: Balancing …



Put the equation balancing

Put the equation balancing moves in order so that they match up with what was done in each step to solve the equation $12x - 6 = 10$.

Teacher Moves

Support for Future Learning
Students will have more opportunities to name the moves for keeping equations balanced while moving towards solving, however they won't be prompted as explicitly to name or label the moves. Consider prompting students to name the moves they are using and recognizing in Lesson 4, Activity 1.

Sample Responses

- Divide both sides by 2
- Add 3 to both sides
- Divide both sides by 6

---

4 Lesson 4: Solving Lin…

Nyanna solved this equation incorrectly:

$f(x)$

Nyanna solved this equation incorrectly:

$$8(x-3)+7=2x(4-17)$$

1. Find and circle an error in her solution.

2. Find the correct solution to the equation.

Use paper to help you with your thinking.

Teacher Moves

Support for Future Learning
Students will have more opportunities to develop fluency with solving multistep equations. However, Lesson 5's cool-down provides a similar error analysis to this cool-down.

Sample Responses

Nyanna made an error moving from line one to line two: $4-17=-13$, not 13 . She also made an error going from steps four to five. She should have subtracted $8x$ from both sides.

The correct solution is $x = \frac{1}{2}$.

5 Lesson 5: Solving Lin…

Melanie and Kala each started solving equation 2 for x.

Melanie and Kala each started solving equation 2 for x.

$$\frac{1}{2}(7x-6)=6x-10$$

One of them made an error.

Who was it?

Teacher Moves

Support for Future Learning
Students will have more opportunities to develop fluency with solving multistep equations. However, Problem 2 in the Practice provides a similar error analysis to this cool-down.

Sample Responses

Melanie made an error.

Responses vary.

Melanie forgot to distribute $\frac{1}{2}$ to both terms in the parentheses. The result of her first step should have been $3.5x-3=6x-10$.

6 Lesson 6: Solving Lin…

Without solving, identify whether this equation has a solution that is positive, negative, or zero:

Without solving, identify whether this equation has a solution that is positive, negative, or zero:

$$3x-5=-3$$

Teacher Moves

Support for Future Learning
If students struggle, plan to discuss the answer to the first problem in the cool-down as a class so that students can hear how other students recognized that the solution must be positive. If students struggle to operate with negative numbers in the second part of the cool-down, leverage the Practice Problems to provide extra attempts with discussion.

Sample Responses

Positive

Responses vary.

If you add 5 to each side, you will be left with positive $3x$ equal to a positive number.

---

7 Lesson 6: Solving Lin…

Solve this equation:

$x-5(x-1)=x-(2x-3)$

f(x)

Solve this equation:

$$x-5(x-1)=x-(2x-3)$$

Use paper to help you with your thinking.

Sample Responses

$x=\frac{2}{3}$

---

8 Lesson 7: Equations …

Teacher Moves

Support for Future Learning
If students struggle with this cool-down, plan to review it as a class and invite students to share their strategies for using the structure of the equations to sort the cards. Consider making an explicit connection between this cool-down and the work in Lesson 8, Screens 4–8.

Sample Responses

Image solution

---

9 Lesson 8: Solving Lin…

Andrea is considering the costs of

f(x)

Andrea is considering the costs of printing p pages at home and at a store.

She wrote the following equation: $100+0.05p=0.25p$

Solve Andrea's equation.

Use paper if it helps you with your thinking.

Teacher Moves

Support for Future Learning

If students struggle to solve and interpret a solution in context, plan to revisit this concept before the quiz.

Sample Responses

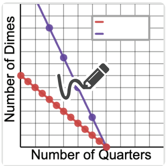
$p = 500$ (or equivalent)

Responses vary.

The solution represents the number of pages for when the cost will be the same for printing at the store and at home.

---

10 Lesson 9: Interpretin…



Here is a graph with two lines.

Here is a graph with two lines.

- One line shows combinations of dimes and quarters that are worth $\$3$ altogether.

- The other line shows combinations of dimes and quarters that total to 12 coins.

How many quarters and dimes would you need to have both 12 coins and $\$3$ at the same time?

Teacher Moves

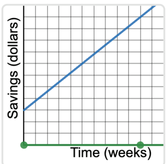
Support for Future Learning
Students will have more opportunities to identify solutions on lines, so if students struggle with this cool-down, there is no need to slow down or add additional work to the next lessons.

Sample Responses

Number of Quarters: 12
Number of Dimes: 0

---

11 Lesson 10: Represe…



Amanda and Trevon started tracking their

Amanda and Trevon started tracking their savings at the same time.

- Trevon starts with $\$15$ and deposits $\$4$ per week. The graph of Trevon's savings is given, and his equation is $y = 4x + 15$, where x is the number of weeks and y is his savings.

- Amanda starts with $\$10$ and deposits $\$5$ per week.

1. Drag the points to graph Amanda's savings.

2. Explain what the intersection point of the graphs means in this situation.

Teacher Moves

Support for Future Learning
If students struggle to graph and interpret the relationship correctly, consider reviewing this cool-down as a class before Lesson 11 or offering individual support where needed during the next lesson.

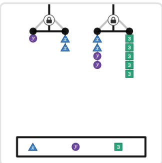
Sample Responses

Responses vary.

In this situation, the intersection at $(5, 35)$ means that after 5 weeks, Trevon and Amanda each have $\$35$.

---

12 Lesson 11: Graphin…



Find the solution to this system of

f(x)

Find the solution to this system of equations:

$y = 2x$
$2x + 2y = 15$

Teacher Moves

Support for Future Learning
If students struggle to solve and interpret the solution of the system, consider reviewing this cool-down as a class before Lesson 12 or offering individual support where needed during the next lesson.

Sample Responses

$(2.5, 5)$

Responses vary.

The solution $(2.5, 5)$ means that when the weight of the triangle is 2.5 and the weight of the circle is 5, both hangers will be balanced. This makes sense because plugging in those values makes each side of Hanger A 5 pounds and each side of Hanger B 15 pounds.

---

13 Lesson 12: Solving …

What is the solution to the system of equations below?

f(x)

What is the solution to the system of equations below?

$$y = 2x$$
$$y = 3x - 10$$

Enter your solution as an ordered pair.

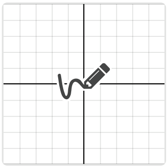
Teacher Moves

Support for Future Learning
Students will have more opportunities to solve a system of equations algebraically, so if students struggle with this cool-down, there is no need to slow down or add additional work to the next lessons.

Sample Responses

$(10, 20)$

14 Lesson 13: Systems…



How many solutions will the following

How many solutions will the following system have?

$$4x + y = 13$$
$$\frac{1}{2}y = -2x + 5$$

Use the sketch tool or paper if that helps you with your thinking.

Teacher Moves

Support for Future Learning
If students struggle to identify the number of solutions a system of equations has, plan to have two different students share their strategies during the following lesson.

Sample Responses

No solutions

Responses vary.

If you rewrite each equation in the form $y =$, both equations will have a slope of -4 . Since they have the same slope but different y -intercepts, this system will have no solutions.

---

15 Lesson 14: Solving …

$\begin{cases} x+y=10 \\ x=2y+1 \end{cases}$

Solve this system of equations.

$f(x)$

Solve this system of equations.

Use paper if it helps you with your thinking.

Teacher Moves

Support for Future Learning
If students struggle to solve a system of equations, consider making time to explicitly revisit these ideas before the End-Unit Assessment.

Sample Responses

$(7, 3)$

8.5 Cool-Downs

Lesson Checklist

- ☐ Complete the lesson using the student preview.
- ☐ Identify how this lesson extends the learning from previous lessons, and how it prepares students for future lessons.
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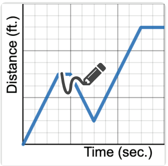
- ☐ Determine the screens where you'll use Pacing and Pause to bring the class together. What questions will you ask on those screens?
- ☐ Anticipate screens where students will struggle, then plan your response.
- ☐ Consider how to use snapshots to select and present student thinking for class discussion.
- ☐ Think about how you will use the results of previous Cool-Downs and student surveys to inform your approach to this lesson.

1 Lesson 1: Making Sense of Gra...



Here is the graph for a new turtle.

Here is the graph for a new turtle. Use the graph to answer the following questions:

1. At 3 seconds, how far is the turtle from the water?

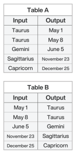
2. When is the turtle 4 feet away from the water?

Sample Responses

1. 6 feet
2. 2 seconds, 5 seconds, and 7 seconds

---

2 Lesson 2: Introduction to Func...



Every birthday has an astrological

Every birthday has an astrological sign, like Gemini or Scorpio. Both tables show a relationship between birthday and astrological sign.

Which table(s) represent a function?

Sample Responses

Table B

Responses vary.

• Table B is a function because for any date (input), there is only one possible astrological sign (output).
• Table A is a not function because each astrological sign (input) has many different outputs.

---

3 Lesson 3: Graphs of Functions...

Select the graphs that represent y as a function of x.

Select the graphs that represent y as a function of x.

Sample Responses

Image solution

4 Lesson 4: Functions and Equa...

Ariel earns $\$9.60$ per hour at their part-time job.

Ariel earns $\$9.60$ per hour at their part-time job.

Ariel wrote the equation $y = 9.60x$.

Which variable is independent based on the equation given?

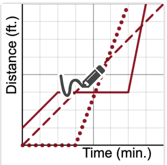
Sample Responses

Number of hours worked

Responses vary.

The independent variable is the input or x-value. If you multiply the number of hours worked by $\$9.60$, you will find the amount of money earned.

5 Lesson 5: Interpreting Graphs ...



Three snails compete in a race.

Three snails compete in a race.

The graph shows their distance vs. time relationships.

Which snail is traveling the fastest at 4 minutes?

Sample Responses

Snail 3

Responses vary.

- At 4 minutes, Snail 3 has the steepest line.
- At 4 minutes, Snail 1 is standing still, Snail 2 is moving at 2 feet per minute, and Snail 3 is moving at $\frac{16}{3}$ (or about 5.3) feet per minute.

6 Lesson 6: Creating Graphs of ...

Which graph could represent the

Which graph could represent the distance between Clem and the seat of the swing vs. time?

Sample Responses

The graph on the left (blue)

Responses vary.

• For most of the graph, Clem is on the swing, so the distance between Clem and the seat of the swing is 0 feet.
• At about 12 seconds, Clem jumps off the swing and his distance from the seat of the swing increases quickly.
• At the end of the video, Clem is much more than 2.5 feet away from the swing.

---

7 Lesson 7: Comparing Represe...

Let's compare areas for circles and

Let's compare areas for circles and squares.

This table shows circle area for specific radius values.

The equation $A = s^2$ gives the area, A, of a square with side length s.

Which is larger?

Sample Responses

A circle with a radius of 1.5 inches

Responses vary.

The area of a square with side length 2.5 inches is 6.25 square inches. The area of a circle with radius 1.5 inches is 2.25π, which is approximately 7.07 square inches. Therefore, the circle is larger.

8 Lesson 8: Modeling With Linea...

Here is a new scenario. A candle is burning.

Here is a new scenario. A candle is burning.

It starts out 12 inches long.
At 1 hour, it is 10 inches long.
At 3 hours, it is 5.5 inches long.

1. Explain one reason why it might be reasonable to model the relationship between time and height of the candle with a linear function.

2. Explain one reason why it might NOT be reasonable to model this relationship with a linear function.

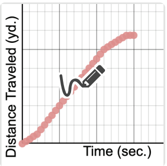
Sample Responses

Responses vary.

1. Based on the data points given, the candle burns about 2 - 2.25 inches every hour. A constant rate (or nearly constant rate) suggests a linear model is appropriate.
2. The candle might not continue to burn at its current approximate rate. For instance, once the candle gets low, it may burn faster. Someone could blow the candle out, which would change the rate.

---

9 Lesson 9: Modeling With Piece...



Abdel ran a 100 -yard dash. The red

$f(x)$

Abdel ran a 100 -yard dash. The red points show his distance every half-second.

Draw line segments to approximately model the data.

Then answer this question:

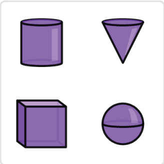
When Abdel was running his fastest, approximately how fast was he running?

Sample Responses

• Image solution

• Approximately 10 yards per second

10 Lesson 10: Exploring Volume



Order the objects by volume from

Order the objects by volume from least to greatest.

Note: All the diameters and heights of the objects are equal.

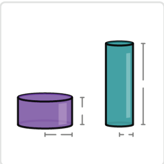
Sample Responses

From least to greatest: cone, sphere, cylinder, cube

Responses vary.

The sphere and cone each clearly fit inside of the cylinder, which clearly fits inside of the cube. The top half of the sphere is slightly larger than the top half of the cone. The bottom half of the sphere is clearly larger than the bottom half of the cone. Therefore, the sphere is larger than the cone.

11 Lesson 11: The Volume of a Cy...



Which cylinder has the greater

Which cylinder has the greater volume?

Use paper and pencil if it helps you with your thinking.

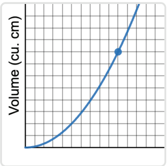
Sample Responses

Short cylinder

Responses vary.

The volume of the short cylinder is $V = \pi \cdot (2)^2 \cdot 2 = 8\pi$. The volume of the tall cylinder is $V = \pi \cdot (1)^2 \cdot 6 = 6\pi$. Therefore, the short cylinder has the greater volume.

12 Lesson 12: Scaling Cylinders ...



Which of the following best describes this

Which of the following best describes this graph?

Teacher Moves

Facilitation
Consider using pacing to restrict students to Screens 11–12.

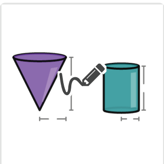
Sample Responses

Radiuses and volumes of cylinders with a 8-cm height.

Responses vary.

The relationship between height and volume is linear, and this graph is not linear, so I knew it had to be a relationship between radius and volume. I noticed that the point $(10, 800\pi)$ was on the curve. That could represent a cylinder that has a radius of 10 and a height of 8, so I concluded that the graph was all cylinders with a height of 8 centimeters.

13 Lesson 13: Volumes of Cones



Which figure has the greater

Which figure has the greater volume?

Use paper and pencil if it helps you with your thinking.

Sample Responses

Cylinder

Responses vary.

The volume of the cone is $\frac{1}{3} \cdot \pi \cdot (3)^2 \cdot 6 = 18\pi$. The volume of the cylinder is $\pi \cdot (2)^2 \cdot 5 = 20\pi$, which is greater than the volume of the cone.

14 Lesson 14: Finding Cylinder a...

The volume of a cone with a height of 6

f(x)

The volume of a cone with a height of 6 inches is 128π cubic inches.

Draw the cone.

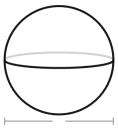
Then determine its radius.

Sample Responses

8 inches

---

15 Lesson 15: Volumes of Spheres



Recall that the volume of a sphere is

f(x)

Recall that the volume of a sphere is given by the formula $V = \frac{4}{3}\pi r^3$, where r represents the radius.

A sphere has a diameter of 10 inches.

Use paper and pencil to calculate the sphere's volume.

Sample Responses

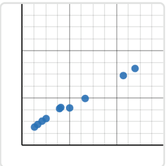
$\frac{500}{3}\pi$ cubic inches

8.6 Cool-Downs

Lesson Checklist

- ☐ Complete the lesson using the student preview.
- ☐ Identify how this lesson extends the learning from previous lessons, and how it prepares students for future lessons.
- ☐ Think about how you will introduce each new section within the lesson to engage students in the task and maintain focus on the learning goals.
- ☐ Determine the screens where you'll use Pacing and Pause to bring the class together. What questions will you ask on those screens?
- ☐ Anticipate screens where students will struggle, then plan your response.
- ☐ Consider how to use snapshots to select and present student thinking for class discussion.
- ☐ Think about how you will use the results of previous Cool-Downs and student surveys to inform your approach to this lesson.

1 Lesson 1: Organizing Data



The graph shows the relationship

The graph shows the relationship between flight time (in hours) and flight distance (in kilometers) for 10 flights.

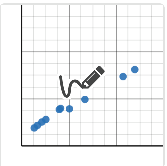
Use the table to label the axes.

Sample Responses

- **Horizontal axis:** Flight distance (kilometers)
- **Vertical axis:** Flight time (hours)

---

2 Lesson 1: Organizing Data



About how long will a 2000 -

$f(x)$

About how long will a 2000-kilometer flight take?

Use the sketch tool if it helps you with your thinking.

Sample Responses

Responses vary.

A ✅ indicates an answer between 2.5 and 3 hours.

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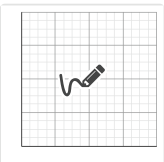
3 Lesson 2: Plotting Data



The table shows measurements

The table shows measurements of right hand length and right foot length for five people.

Use the sketch tool to create a scatter plot of the data.

Sample Responses

The graph should have points located at $(19, 27)$, $(21, 30)$, $(17, 23)$, $(18, 24)$, and $(19, 26)$.

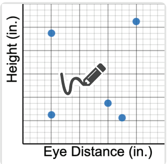
Student Supports

Students With Disabilities

- *Fine Motor Skills: Peer Tutors*

Pair students with their previously identified peer tutors and allow students who struggle with fine motor skills to dictate physical manipulation of objects and graphing as needed.

4 Lesson 3: What a Point on a S...



The table shows the heights and

The table shows the heights and eye distances for some of the robots in the scatter plot.

1. Circle the point in the scatter plot that represents Robot B.

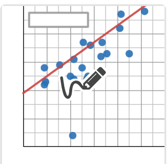
2. Plot a point in the scatter plot that represents Robot E.

3. Fill in the table with the values representing Robot F.

Sample Responses

1. The point $(2, 38)$ should be circled.
2. There should be a point added at $(7, 22)$.
3. Row F in the table should have 6 for eye distance and 14 for height.

5 Lesson 4: Lines of Fit and Outl...



Here is a scatter plot that shows

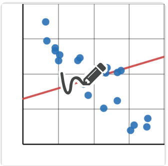
Here is a scatter plot that shows the lengths and widths of 20 left feet together with the graph of a model of the relationship between foot length and width.

Circle the point that represents the foot length closest to 29 centimeters. Then complete the table below.

Sample Responses

- **Actual Width:** About 10.3 centimeters
- **Predicted Width:** About 11.6 centimeters

6 Lesson 5: Fitting a Line to Data



Binta thinks this line is a good fit

Binta thinks this line is a good fit because half of the points are on one side of the line and half of the points are on the other side.

Is Binta correct?

Sample Responses

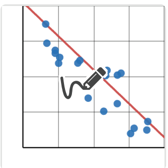
No

Responses vary.

• The line is not a good fit because the data shows a negative association, but the line has a positive slope.
• The line does not follow the dots.
• The line is increasing, but the data is decreasing

---

7 Lesson 5: Fitting a Line to Data



Marco thinks this line is a good fit

Marco thinks this line is a good fit because it passes through the left-most point and the right-most point.

Is Marco correct?

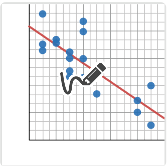
Sample Responses

No

Responses vary.

• The line is not a good fit because most of the points are below it.
• The line is not a good fit because the trend of the scatter plot is steeper than the slope of the graph.
• It isn't close to as many of the points as another line could be.
• Marco is wrong because if he shifted the line down, it could be through more dots compared to the line he created.

8 Lesson 6: The Slope of a Fitte...



Here is a scatter plot that shows the

Here is a scatter plot that shows the age of some used cars and their prices in 2020, together with the graph of a linear model for the relationship between price and age.

Approximate the slope of the linear model shown in the scatter plot.

Sample Responses

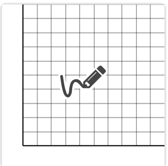
$-1\,000$

Responses vary.

For every 1 -year increase in age, the predicted car price decreases by about $1\,000$ dollars.

---

9 Lesson 7: Observing More Patt...



Make a scatter plot that has a POSITIVE LINEAR association WITH

Make a scatter plot that has a POSITIVE LINEAR association WITH clustering.

Sample Responses

Responses vary.

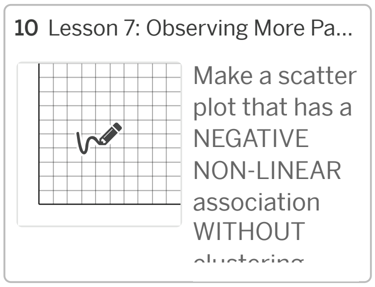
A scatter plot with a clear separation between groups of points, generally increasing at a constant rate from left to right.

Student Supports

Students With Disabilities

• *Fine Motor Skills: Peer Tutors*

Pair students with their previously identified peer tutors and allow students who struggle with fine motor skills to dictate graphing as needed.

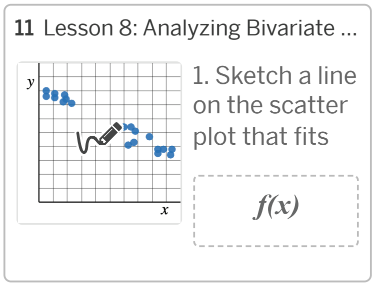


Make a scatter plot that has a NEGATIVE NON-LINEAR association WITHOUT clustering.

Sample Responses

Responses vary.

A scatter plot with no clear separation between groups of points, generally decreasing from left to right.



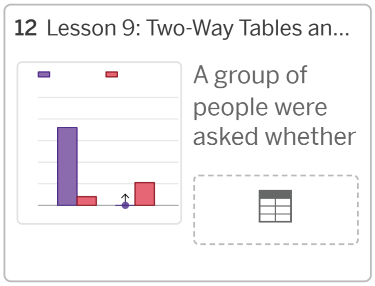
1. Sketch a line on the scatter plot that fits the data well.

2. If a new point is added to the scatter plot with $x = 4$, what do you predict for the y-value of this point?

Sample Responses

Responses vary.

1. The graph of the line $y = 8.2 - 0.5x$.
2. $5.9, 6, 6.2$



A group of people were asked whether or not they liked their food and if they were satisfied with the service at a restaurant.

Some of the responses are recorded in the two-way table and the bar graph.

1. Complete the table.

2. Drag the point in the bar graph to make the representations match.

Sample Responses

Graph

• The Satisfied With Service/Did Not Like Food bar in the bar graph should be 9 units tall.

Table
• Liked Food/Dissatisfied With Service: 8
• Liked Food total: 80
• Did Not Like Food/Satisfied With Service: 9
• Total surveyed: 110

13 Lesson 10: Using Data Displa...

The data shows responses

The data shows responses from 110 people who were asked whether they liked the food and the service at a restaurant.

Is there an association between liking food and liking service?

Sample Responses

Association

Responses vary.

• The relative frequency table shows that 90% of those who liked the food also liked the service, while only 30% of those who didn't like the food did like the service.

• The segmented bar graph shows that those who liked the food generally liked the service, while those who didn't like the food generally didn't like the service.

14 Lesson 11: Creating Data Rep...

Students in two different classes were

Students in two different classes were asked whether they prefer math, English, or science.

Here is a frequency table and a segmented bar graph showing the results.

Is there evidence of an association between class and favorite subject?

Sample Responses

Responses vary.

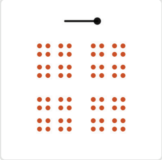
No. There isn't an association because class isn't helpful in predicting favorite subject. It's always English regardless of the class.

8.7 Cool-Downs

Lesson Checklist

- ☐ Complete the lesson using the student preview.
- ☐ Identify how this lesson extends the learning from previous lessons, and how it prepares students for future lessons.
- ☐ Think about how you will introduce each new section within the lesson to engage students in the task and maintain focus on the learning goals.
- ☐ Determine the screens where you'll use Pacing and Pause to bring the class together. What questions will you ask on those screens?
- ☐ Anticipate screens where students will struggle, then plan your response.
- ☐ Consider how to use snapshots to select and present student thinking for class discussion.
- ☐ Think about how you will use the results of previous Cool-Downs and student surveys to inform your approach to this lesson.

1 Lesson 1: Exponent …



How many circles will there be in Stage 4?

f(x)

How many circles will there be in Stage 4?

Sample Responses

256 (or equivalent)

---

2 Lesson 1: Exponent …

How many times as large as 4^4 is 4^7?

f(x)

How many times as large as 4^4 is 4^7?

Sample Responses

64 times as large (or equivalent)

---

3 Lesson 2: Equivalent …

Which expressions are equivalent to 8^6?

Which expressions are equivalent to 8^6?

Sample Responses

- $(8^3)^2$
- $2^6 \cdot 4^6$

---

4 Lesson 3: Multiplying …

Write at least four different expressions that have the same value as $(3^4)^2$ using only

Write at least four different expressions that have the same value as $\left(3^4\right)^2$ using only numbers, multiplication, and exponents.

Sample Responses

Responses vary.

- 3^8
- $3^{(4 \cdot 2)}$
- $3^4 \cdot 3^4$
- $(3 \cdot 3 \cdot 3 \cdot 3)^2$

5 Lesson 4: Rewriting E…

Select each expression that can be rewritten as 8^8.

Select each expression that can be rewritten as 8^8.

Sample Responses

- $2^8 \cdot 4^8$
- $\dfrac{8^{10}}{8^2}$
- $\dfrac{8^2 \cdot 8^3 \cdot 8^4}{8^1}$

6 Lesson 5: Using Patt…

Select each expression that is equivalent to 10^{-6}.

Select each expression that is equivalent to 10^{-6}.

Sample Responses

- $\dfrac{1}{10} \cdot \dfrac{1}{10} \cdot \dfrac{1}{10} \cdot \dfrac{1}{10} \cdot \dfrac{1}{10} \cdot \dfrac{1}{10}$
- $\dfrac{10^3}{10^9}$

7 Lesson 6: Generalizin…

Yona was trying to write $2^3 \cdot 2^2$ as a single power of 2 and wrote the following:

Yona was trying to write $2^3 \cdot 2^2$ as a single power of 2 and wrote the following:

$$2^3 \cdot 2^2 = 2^{3 \cdot 2} = 2^6$$

Is Yona correct?

Sample Responses

No

Responses vary.

When multiplying terms with the same base, you can simplify by adding the exponents.

---

8 Lesson 7: Describing …

Write each number as a single multiple of a power of 10.

Write each number as a single multiple of a power of 10.

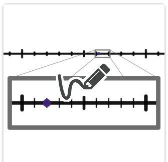
Sample Responses

Responses vary.

- $123 \cdot 10^{-6}$
- $123 \cdot 10^{6}$

---

9 Lesson 8: Representi…



What number is represented by the point on

f(x)

What number is represented by the point on the number line?

Sample Responses

$6.2 \cdot 10^{-8}$ (or equivalent)

10 Lesson 9: Applicatio…
There are about:

- $8 \cdot 10^9$ grains of sand in one

There are about:

- $8 \cdot 10^9$ grains of sand in one cubic meter
- $1 \cdot 10^{11}$ stars in the galaxy
- $7.5 \cdot 10^9$ cubic meters of sand on Earth
- $1 \cdot 10^{10}$ galaxies in the universe

Which is larger?

Sample Responses

The number of stars in the universe is larger.

Responses vary.

$(1 \cdot 10^{11}) \cdot (1 \cdot 10^{10})$ is $1 \cdot 10^{21}$ stars in the universe. There are only $60 \cdot 10^{18}$ grains of sand because $(8 \cdot 10^9) \cdot (7.5 \cdot 10^9)$ is $60 \cdot 10^{18}$.

---

11 Lesson 10: Definitio…

Sample Responses

- $4.82 \cdot 10^4$
- $9.9 \cdot 10^{-4}$
- $3.6 \cdot 10^6$

---

12 Lesson 11: Multiplyi…
Fill in the blank:

$6.1 \cdot 10^{13}$ is about

f(x)

Fill in the blank:

$6.1 \cdot 10^{13}$ is about _______ times as large as $2.1 \cdot 10^2$.

Use scientific notation.

Sample Responses

Responses vary.

$3 \cdot 10^{11}$

---

13 Lesson 12: Adding …
Add these two numbers:

$2.3 \cdot 10^5 + 3.6 \cdot 10^6$

f(x)

Add these two numbers:

$$2.3 \cdot 10^5 + 3.6 \cdot 10^6$$

Write your answer in scientific notation.

Sample Responses

$3.83 \cdot 10^6$ watts

---

14 Lesson 13: Let's Put…
As of 2019, there were about $210\,000\,000$ adults in the United States

f(x)

As of 2019, there were about $210\,000\,000$ adults in the United States.

On average, they each purchased 60 clothing items per year.

About how many clothing items did all of the adults in the United States purchase in 2019?

Express your answer using scientific notation.

Sample Responses

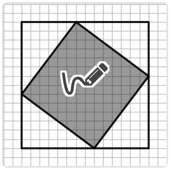
$1.26 \cdot 10^{10}$ items

8.8 Cool-Downs

Lesson Checklist

- ☐ Complete the lesson using the student preview.
- ☐ Identify how this lesson extends the learning from previous lessons, and how it prepares students for future lessons.
- ☐ Think about how you will introduce each new section within the lesson to engage students in the task and maintain focus on the learning goals.
- ☐ Determine the screens where you’ll use Pacing and Pause to bring the class together. What questions will you ask on those screens?
- ☐ Anticipate screens where students will struggle, then plan your response.
- ☐ Consider how to use snapshots to select and present student thinking for class discussion.
- ☐ Think about how you will use the results of previous Cool-Downs and student surveys to inform your approach to this lesson.

1 Lesson 1: The Areas of Tilted S...



Determine the area of the shaded

f(x)

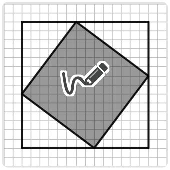
Determine the area of the shaded square.

Sample Responses

100 square units

---

2 Lesson 1: The Areas of Tilted S...



What is the side length?

f(x)

What is the side length?

Sample Responses

10 units

---

3 Lesson 2: Side Lengths and Ar...

Complete the table for each square.

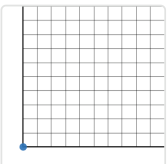
Complete the table for each square.

Sample Responses

Side length of Square A: $\sqrt{100}$ or 10
Side length of Square B: $\sqrt{95}$
Area of Square C: 36
Side length of Square C: $\sqrt{30}$

---

4 Lesson 3: Approximating Squa...



Drag the blue point to estimate the

f(x)

Drag the blue point to estimate the location of $\sqrt{18}$ on the x-axis.

Then approximate $\sqrt{18}$ as a decimal.

Sample Responses

The point and the decimal response should be between 4.1 and 4.4.

5 Lesson 4: Reasoning About Sq...

Which of these numbers are greater than 6 and less than 8?

Which of these numbers are greater than 6 and less than 8?

Sample Responses

- $\sqrt{47}$
- $\sqrt{60}$

Responses vary.

Since $6^2 = 36$ and $8^2 = 64$, the square roots of values between 36 and 64 will evaluate to be between 6 and 8.

---

6 Lesson 5: Edge Lengths, Volu...

What is the exact solution to $x^3 = 150$?

f(x)

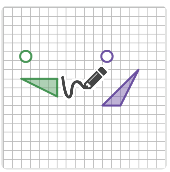
What is the exact solution to $x^3 = 150$?

Sample Responses

$x = \sqrt[3]{150}$, which is between 5 and 6, because 150 is between $5^3 = 125$ and $6^3 = 216$.

---

7 Lesson 6: Exploring Squares in...



For which triangle(s) will the equation

For which triangle(s) will the equation $a^2 + b^2 = c^2$ be true?

Use the sketch tool if it helps you to show your thinking.

Sample Responses

Triangle L

Responses vary.

The Pythagorean theorem only applies to right triangles.

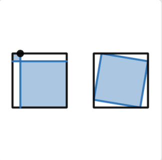
Student Supports

Students With Disabilities
- *Conceptual Processing: Eliminate Barriers*

Allow students to use calculators to ensure inclusive participation in the activity.

---

8 Lesson 7: A Proof of the Pytha...



Adjust the point to create two figures

Adjust the point to create two figures that show $3^2 + 4^2 = 5^2$.

1. Explain how you can see the above equation in the figures.

2. Describe how this relates to the Pythagorean theorem.

Sample Responses

The diagram should show squares with side lengths of 7 units, and each side should include line segments of length 3 and 4 units.

Responses vary.

1. The areas of the two large squares are the same since they are both 7 by 7 units. The area of the two unshaded rectangles in the left square is the same as the area of the four unshaded triangles in the right square (each pair of triangles makes a rectangle). So the area of the two smaller shaded squares on the left must be the same as the area of the tilted shaded square on the right. This means $3^2 + 4^2 = 5^2$.

2. The Pythagorean theorem also says that $3^2 + 4^2 = 5^2$ (because 3 and 4 are the lengths of the legs and 5 is the length of the hypotenuse of this right triangle).

---

9 Lesson 8: Finding Unknown Si...

A right triangle has sides of length

f(x)

A right triangle has sides of length 3, 4, and x.

What is a possible value for x?

Use the sketch tool if it helps you to show your thinking.

Sample Responses

Responses vary.

- 5
- $\sqrt{7}$

There are two possible responses for x because it can be a leg or a hypotenuse.

---

10 Lesson 9: The Converse of th...

Is this a right triangle?

Is this a right triangle?

Use the sketch tool if it helps you to show your thinking.

Sample Responses

No

Responses vary.

$7^2 + 10^2$ is not equal to 12^2.

---

11 Lesson 10: Applications of the...

Television screens are classified by

f(x)

Television screens are classified by the length of their diagonal.

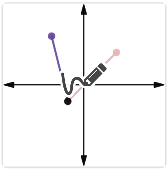
The television screen shown here is 22.5 inches tall and 40 inches wide.

What is the length of its diagonal?

Sample Responses

45.9 inches or equivalent, such as $\sqrt{40^2 + 22.5^2}$.

12 Lesson 11: Finding Distances i...



The graph shows two line

The graph shows two line segments: a and b.

What is the length of each segment?

Sample Responses

$a = \sqrt{17}$
$b = \sqrt{18}$

13 Lesson 12: Decimal Represen...

Does the decimal representation of $\frac{1}{30}$

Does the decimal representation of $\frac{1}{30}$ terminate or repeat?

Sample Responses

$\frac{1}{30}$ will repeat because $\frac{1}{30} = \frac{1}{2 \cdot 3 \cdot 5}$, and the denominator includes at least one factor other than 2 or 5.

14 Lesson 13: Infinite Decimal Ex...

Write each decimal as a fraction.

Write each decimal as a fraction.

Sample Responses

- $0.147 = \frac{147}{1000}$
- $0.\overline{147} = \frac{147}{999}$

15 Lesson 14: Rational and Irrati...

Enter two examples of a rational number and two examples of an irrational number in the

Enter two examples of a rational number and two examples of an irrational number in the table.

Sample Responses

Responses vary.

- **Rational:** 3, 0.7

- **Irrational:** $\sqrt{101}$, $\sqrt[3]{2}$